UNIVERSITÉ DU QUÉBEC À MONTRÉAL

VARIATION IN PRODUCTION OF DENTAL FRICATIVES

A SOCIOLINGUISTIC STUDY OF THE VERNACULAR ICELANDIC SPOKEN IN REYKJAVÍK, ICELAND

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Toi que j'ai surement oublié de mentionner: *þakka þér!*
Et finalement, Montréal, à ta santé. *Skál!*

FOREWORD

Sometime in the fall of 2009 I had a discussion with my wife on the subject of whether the letters *Þ* and *Ð* represented the same sound in Icelandic.

We disagreed.

In a sense, this thesis is my "I told you so".

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RÉSUMÉ

C'est la première fois qu'une étude propose de décrire et d'analyser la variation linguistique à Reykjavik, en Islande. L'étude regarde la variation dans la production de fricatives dentales sous-jacentes dans le cadre de la sociolinguistique variationniste quantitative.

L'islandais est traditionnellement présenté comme étant une langue stable et homogène, contrairement à l'hypothèse variationniste selon laquelle toute langue montre des signes de la variation sociale.

L'étude explore d'abord les causes possibles de cette impression d'homogénéité, en se référençant tant à l'histoire sociale de l'Islande qu'aux études dialectales précédentes. Néanmoins, il semble que les adolescents habitant dans l'ouest de la ville favorisent plus fréquemment les formes prescriptives standards, lors de tests de jugements grammaticaux, que leurs homologues du reste de l'ile. L'analyse de la variation dans la production de fricatives dentales (jusqu'à ce jour non-spécifiée) comme variable dépendante est motivée par des observations issues d'études antérieures. Ces études ont signalé notamment l'élision générale et le voisement stylistique de fricatives dentales dans l'attaque initiale et dans la coda en fin de mot.

Les résultats de cette étude soutiennent dans une certaine mesure la position traditionaliste, car, parmi les facteurs sociaux les plus souvent recensés, seuls l'âge et l'âge en interaction avec le sexe sont significatifs pour l'effacement des fricatives dentales en islandais. Les facteurs sociaux tels que la classe sociale, le lieu de résidence et le niveau d'éducation n'ont pas eu d'effets significatifs dans l'analyse statistique.

Les facteurs linguistiques permettent de déterminer qu'il y a des contraintes linguistiques dans la variation de la variable dépendante dans l'usage vernaculaire. L'étude monte en effet une relation entre l'effacement et le voisement des fricatives dentales dans les extrémités des mots. Les résultats de cette étude indiquent que le facteur le plus important pour l'effacement est la position syllabique. Les fricatives dentales ont plus tendance à être effacées ou voisées en fin de mot qu'en début de mot.

Mots-clés : Variation et changement linguistique, sociolinguistique, l'islandais vernaculaire

ABSTRACT

This study is the first to describe and analyse the state of linguistic variation in the speech community of Reykjavík, Iceland, with respect to variation in production of underlying dental fricatives and using a quantitative, variationist sociolinguistic framework.

The Icelandic language is traditionally portrayed as stable and homogenous, in contradiction of the underlying hypothesis of most research in variationist sociolinguistics that all lánguages include social variation. As improbable as it may seem, this study largely upholds the traditionalist position, showing that only age and its interaction with sex are relevant social factors in Icelandic fricative deletion patterns. Other social factors related to class, location and education showed no significant effect in statistical analyses.

The study begins by looking at the motivation for this perception of homogeneity, with references to the social history of the island as well as previous dialectal studies. Nevertheless, teenagers from the western part of the city seem to adhere to a greater extent to standard prescriptive grammar (as determined through grammatical judgement tests) than their counterparts in the rest of the country. The use of variation in dental fricatives as a dependent variable, a previously undescribed variable context, is supported by indications in previous descriptive works, which note a stylistic deletion of dental fricatives, and of their stylistic voicing in word initial onsets and word final codas.

In addition to examining social factors, this study also investigates the grammatical factors that condition the deletion and voicing of dental fricatives in Icelandic, showing, for the first time the relationship between deletion and voicing. This research indicates that the most significant factor in Icelandic fricative deletion and voicing variation is syllable and word position, with more deletion/voicing at the end as compared to the beginning of words.

Keywords: Language variation and change, sociolinguistics, vernacular Icelandic

INTRODUCTION

Traditionally, Icelandic has a popular reputation as a stable and homogenous language (e.g. Karlsson, 2004; Leonard, 2011), whereas variationist sociolinguistics typically assumes that every language must have (structured) variability so as to fulfill its social functions (Milroy & Gordon, 2003, p. 4). This homogeneity has been attributed to the central role that language plays in the construction of Icelandic identity, both in the sociohistorical context, as well as in the efforts of 20th century language purists to control the language (c.f. Þorgeirsdóttir & Skúlason, 2014). This view has also found some linguistic support in dialect studies, which have shown a progressive levelling of known dialectal markers/indicators (Þráinsson & Árnason, 1984, 1992), leaving the language with little obvious social variation.

This general perception has yet to be empirically tested, as "work based on standard sociolinguistic fieldwork and methodology is practically non-existent" in Iceland (F. Friðriksson, 2008, p. 111).[1] Nevertheless, there have been some indications of the existence of social variation in Icelandic. For example, grammatical judgement tests have hinted at a divide within Reykjavík, the capital of the island, delimiting the western part of the city from the rest of the country (Maling & Sigurjónsdóttir, 2002; Svavarsdóttir, 1982; Svavarsdóttir, Pálsson, & Thorlindsson, 1984). This variation has not been statistically confirmed in vernacular language due to the morphosyntactic nature of the dependent variables used and the manner of their elicitation (i.e. there are too few tokens from spontaneous speech) (F. Friðriksson, 2008). It would thus appear to be of some interest to study this supposed social

[1] As it was deemed non-pertinent due to a perceived lack of socio-economic and sociolinguistic variation (Pálsson & Durrenberger, 1992, p. 304; Svavarsdóttir, Paatola, & Sandøy, 2010, p. 56).

division using a phonological variable, which, according to Árnason (2011), is reputedly subject to stylistic variation.

The present study is based on data extracted from a corpus of 33 socio-linguistic interviews with native speakers of Icelandic. By examining the production of dental fricatives in Iceland, this study tests the hypothesis that Icelandic shows normal signs of sociolinguistic variation. As such, it is the first attempt to analyse the sociolinguistic situation in Iceland using a variationist framework (e.g., through quantitative statistical analysis of naturalistic speech data).

Chapter 1 provides an overview of previous work on language variation in Iceland, providing context for the discussion of the need for a reliable dependent variable to diagnose the presence or absence of sociolinguistic variation. It is proposed that discrete variation in the production (and deletion) of voiced and voiceless dental fricatives, [θ] and [ð][2], and the voicing of the dental fricative in initial onset and final coda positions adequately fulfills this function. Chapter 2 explains the methodological underpinnings of the study. The naturalistic speech output of native speakers of Icelandic, which serves as data for this study, were extracted from sociolinguistic interviews, and are coded for a number of internal (linguistic) and external (social) factors. Chapter 3 presents the results of statistical analyses of data from the study.

Finally, Chapter 4 presents a discussion and analyses of these findings. Study results demonstrate the usefulness of dental fricatives as a dependent variable for the study of Icelandic. Specifically, the variation is structured by statistically significant language internal constraints, in particular syllable position, with word final dental fricatives deleting and voicing more than word initial dental fricatives. There are also some effects of language external constraints that provide tentative support for the hypothesis that there is a sociolinguistic boundary within Reykjavík. These social

[2] [θ] as in 'thing' and [ð] as in 'this'

effects are nevertheless minimal, other than an overall significant correlation with age.

CHAPTER I
ICELANDIC VARIATION

This chapter explains various difficulties involved in doing a sociolinguistic study on Icelandic. It provides a brief overview of the sociohistorical context of Reykjavík and it discusses the ideological place of language within the national identity. The chapter also looks at previous studies touching on language variation in Iceland, in particular a possible sociolinguistic boundary within Reykjavík.

section 1.1: the community

The Icelandic community amounts to around 320,000 individuals[3] with some 207,000 individuals living in the greater Reykjavík area[4], of whom 124,000 live in the municipality of Reykjavík itself[5].

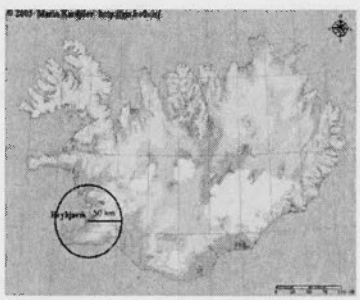

Figure 0.1 Map of Iceland with position of Reykjavík pointed out

The city experienced a period of eastward expansion during the 20th century, with new neighborhoods being built progressively towards the east but with little densification of older western neighborhoods. A river marks a natural, geographic boundary between the eastern and western parts of the city, with about half of the population

[3] www.hagstofan.is statistics retrieved 11/04/2013.
[4] In total there are some 240,000 living within a maximum of 45 min. drive from the center of Reykjavík
[5] The steady migratory influx into Reykjavík during the 20th century (Bernharðsson, 1998, p. 9) might qualify the city for "dialectal swamping" (e.g. Labov, 2007, p. 381) as far as the concept can be applied to Icelandic, going from 3% of the population in 1870 (F. Friðriksson, 2008, p. 42) to 38% (excluding the bedroom communities surrounding it) in 2013. This question lies outside the scope of the present study, but might nevertheless affect the results.

living in the eastern suburbs. The youngest neighbourhood in the western part is only slightly older than the oldest neighbourhood east of the river.

The fact that highly qualified jobs in Iceland are concentrated in and around Reykjavík has meant that those who moved to the city for their education had a tendency to stay (Bernharðsson, 1998, p. 339). Nevertheless, compared to cities in Scandinavian and Western European countries, Reykjavík is a city of mixed neighborhoods, with few socio-economic differences (Bernharðsson, 1998, p. 261),[6] and the situation in Reykjavík and in Iceland in general, can thus be said to be socio-culturally homogeneous.

F. Friðriksson (2008, pp. 79-80) states that the "stability of the Icelandic language" is considered to be the center of Icelandic identity. Pálsson and Durrenberger (1992, pp. 303-305) remark that an individual is "Icelandic to the extent that he or she speaks pure Icelandic" and that non-standard variation in Icelandic is perceived as a *sýki*, 'a disease' (in the case of (morpho-)syntactic variations) or as sound error (*hljóðvilla*) in the case of non-standard phonological variants. Because class variation is seen as a contradiction to the Icelandic identity of a homogenous nation, non-standard variation has been perceived as a sign of "deficiency" of the individual (and not as related to class or other social factors) (Pálsson & Durrenberger, 1992, pp. 301-306). In sum, there has not been any allowance for non-standard variation in the traditional national discourse of Iceland, and non standard deviations have generally been pushed out of use.[7]

Nation-building endeavours in Iceland during the late 19th and early 20th century revolved around the importance of language for the national identity, which is

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[6] Despite this relative socio-economic homogeneity, it must be noted that parts of the eastern part do have an image of being of a lower socio-economical status, as one neighborhood in the east in particular, Fellahverfi, has a higher than average share of low income families (Bernharðsson, 1998, p. 262).

[7] For discussion on the near dissapearence of the best known *hljóðvilla* see Arnbjörnsdóttir (2006).

founded on the literary heritage of the 12th and 13th century sagas (Karlsson, 2004, p. 7; Pálsson & Durrenberger, 1992, p. 303). The idea that the Sagas can be read with ease and without any special instruction by the lay native speaker of Icelandic is generally accepted and follows directly from the idea that Icelandic is a diachronically stable language (F. Friðriksson, 2008; Karlsson, 2004) where dialectal differences are virtually non-existent (Karlsson, 2004, p. 7; Leonard, 2011).

section 1.2: linguistic homogeneity?

Despite a perceived lack of variation in Icelandic due to social factors, there are nevertheless known cases of variation on the basis of geographic region, henceforth called dialects. The Icelandic language has become phonologically more homogenous and most of the attested dialectal distinctions of the middle of the 20th century are said to have more or less disappeared. This is discussed in this subsection.

Guðfinnsson (1950), in his extensive phonological survey, split Iceland roughly into three different phonological isogloss zones, a northern part, a southern part and in-betweens in parts of the east and west coasts. People in Reykjavík used all variations of each given variable, while people in the north and south near categorically favour the variant associated with their region from each variant pair, making them relatively internally homogenous (Guðfinnsson, 1950, p. 153).

Þráinsson & Árnason (1984, 1992) sought to produce a comprehensive descriptive account of the Icelandic dialects, but also wanted to study change in real and apparent time. Of the phonological variables that Guðfinnsson had identified, most were disappearing by the time of Þráinsson and Árnason's study, except those of northern Iceland (Gunnlaugsson, 1987). Other studies (F. Friðriksson, 2008; Maling & Sigurjónsdóttir, 2002; Svavarsdóttir, 1982) have focused on morphosyntactic change.

These studies of phonological variables, where they have taken other social factors into account, have not revealed any robust effects. Yet as Tagliamonte observes social influences should be easily detected when scrutinizing speech (2012, p. 177). Sociolinguists conducting research in the variationist paradigm expect a language to "vary systematically according to style and socioeconomic status" (Rickford & Eckert, 2001, p. 18) in a way that is "linguistically insignificant but socially significant" (Chambers, 2002, p. 3).[8] Scholars working on Icelandic have felt that "a variation in usage is a prerequisite for a sociolinguistic analysis to be of interest" (Svavarsdóttir et al., 2010, p. 52), and have therefore sought other interests, as no social variation had been acknowledged in vernacular Icelandic.

However, Svavarsdóttir (1982; 1984), in her grammaticality judgement test for children regarding quirky case subject verbs,[9] did find a response difference that correlated with the region where the children lived (with Reykjavík having a more standard response than the rest of the country) and this response also correlated to the educational level and the employment of the father. In particular, children from a more educated home were more likely to choose the standard variant than the non-standard construction (1982, p. 45). Thus, Svavarsdóttir's study was the first to show a correlation in Icelandic between variation and an aspect of social class, i.e. educational level, on a grammaticality judgement test.

It can be argued that Nowenstein (2012) seems to substantiate the influence of education for quirky case verbs. In a grammatical judgement test, simple sentence structures (similar to the examples used in textbooks against the non-standard

[8] A linguistic variable in a variationist study is expected to correlate with a set of constraining, independent variables. According to Tagliamonte, these are "the features associated with the variation. They can be external to the grammar [i.e. external/social factors], out in the world, relating to aspects of the social context, situation, community setting, or register. They can also be internal to the grammar [i.e. internal/grammatical factors], relating to the linguistic environment such as the grammatical category of the word, the type of subject in the clause, or its function" (Tagliamonte, 2012, p. 7).

[9] For further information regarding verbs with quirky case subjects, where the subject takes Accusative or Dative case instead of Nominative, see for example Eythorsson (2001).

version) had a more standard response rate than sentence structures that were uncommon in textbooks.[10] This can be interpreted as a learnt reflex.

With this in mind, it has been suggested that this socio-economic variation and the differences between Reykjavík and the rest of country are related to the fact that the general level of education in Iceland is at its highest in western Reykjavík and in some of its neighbouring municipalities (which primarily serve as bedroom communities of the capital city), while it is lower in Reykjavík's eastern part and elsewhere in the country (F. Friðriksson, 2008, p. 123).

Maling and Sigurjónsdóttir (2002), testing teenagers' acceptance rate for an emerging syntactic phenomenon,[11] found that there was a difference in acceptability rate for the new construction with respect to the factors of geography, education and age. The innovative form was almost categorically rejected by all of the adult controls irrespective of place of residence. Yet it was accepted by the majority of teenagers from all over the country (especially whose parents had little formal education), except those from western Reykjavík. The distinction appears to show an interaction between geographical and educational factors. Teenagers in western Reykjavík, whose parents had little formal education, had lesser tolerance for the non-standard innovative form than teenagers elsewhere, even those whose parents had university degrees.

This suggests that the variation in acceptance rates on grammatical judgement tests cannot simply be explained by educational level as was previously suggested. Rather, these results hint at an interaction between geographical- and educational-factors

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[10] The participants were for example more likely to choose the standard case (accusative) for the subject of the verb *langar*, 'want', if it was a second person singular pronoun *þú*, 'you', than for the complex nominal phrase *þessir skemmtilegu strákar*, 'these fun boys' (Nowenstein, 2012, p. 46)

[11] The 'new impersonal' or 'new passive' syntactical structure which allows sentences like:

Það	*var*	*lamið*	*stúlkuna*	*í*	*klessu*
it(EXPL) was	hit-neut.sg.		the.girl-f.sg.ACC	in	a.mess

'The girl was badly beaten'

(Maling & Sigurjónsdóttir, 2002, p. 98)

within Reykjavík, separating the Western region from the rest of the country. Importantly, these differences have been partially supported in a later study on natural language output, but they have not been statistically confirmed, due to their rarity in spontaneous speech (F. Friðriksson, 2008, pp. 199, 206).

In order to empirically test the existence of an emerging linguistic divide between the western part of Reykjavík and the rest of the country, it is necessary to identify a dependent variable which occurs frequently enough in spontaneous speech as to provide a sufficient sample of naturally produced tokens for statistical analysis. Þráinsson and Árnason's study provides some interesting phonological leads. They identified some recurrent reduction mechanisms which they connect to rapid speech, in particular, the elision of fricatives, nasals and even syllables and the assimilation of nasals (Þráinsson & Árnason, 1992, p. 100, and 1984, p. 128). Specifically, considering all fricative deletions together, they found a significant correlation between age and deletion across apparent time, with the likelihood of deletion increasing as age of informants decreased (1984, p. 129).

Furthermore, in a study of the acquisition of Icelandic as a second language with a main focus on phonological acquisition (Hávarðarson, 2012), it was demonstrated that the two native informants, used as a control group, shared the same approximate deletion rate for dental fricatives of roughly 20 percent. The variation was also shown to be context-dependent, as the dental fricative deletion is favoured word finally,[12] but particularly when followed by a consonant-initial word as in the following example:

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[12] A word can have one or more syllables. A syllable necessarily contains a vowel in its rhyme (position) and maximally an onset, rhyme and coda; with consonants in the preceding onset, and following coda positions. For further information regarding phonological syllable construction see for example Brousseau and Nikiema (2001, pp. 120-136). This study looks at dental fricatives and the different constraints and variation they show in the onset and coda positions. It also distinguishes between word-internal positions and word-initial and word-final positions, for reasons which are listed later in this chapter. The denominations onset position/coda position and onset/coda are used interchangeably.

1) *Að fara*: [að.fara][13] vs. [a.fara] 'to go'

The dental fricatives are frequently found in function words in Icelandic. For example, *að*, [að] (which acts as a conjunction, an infinite particle and preposition 'to') is the second most frequent word in Icelandic and *það*, [θaθ], (which serves as a pronoun and adverb, 'it, that') is the fourth.[14] This means that they can be found in very frequent words, as well as in infrequent items, giving a robust sample of tokens for the purpose of statistical analysis. This, together with the already observed stylistic tendency for deletion, suggests variation in production of dental fricatives may serve as a promising variable for a variationist sociolinguistic study.

section 1.3: dental fricatives

There are two dental fricatives in Icelandic, voiced [ð] and voiceless [θ]. These dental fricatives, due to their complimentary distribution and apparent neutralization, are considered allophones in Icelandic (Árnason, 2011, p. 107). Their general distribution is that initial onsets are voiceless, e.g. *þari* [θa:.ri] 'seaweed', (Árnason, 2011, p. 161) whilst word internal codas can be voiced, e.g. *stöðva* [stœð.va] 'to stop', or voiceless, e.g. *maðkur* [maθ.kʏr̥] 'maggot', depending on whether the following phoneme is a voiceless consonant or not (Árnason, 2011, p. 165). No voiceless fricatives occur in word-internal onsets, .(e.g. *taða* [t^{h}a:.ða] 'hay' (*[t^{h}a:.θa]) (Árnason, 2011, p. 167)), except in composite words,(e.g. *skjalaþýðandi* [sk^{h}ja:.la:.θi:.ðan̥.dI] 'document translator'), where the phonemic boundary between the two lexemes is maintained. The effect that position within the lexical unit has is easily observable in the post-lexical devoicing of word final fricatives that is activated before a pause (Árnason, 2011, p. 237)

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[13] This study uses the IPA system for phonological transcriptions. Each sound is represented by one symbol in the IPA system. This study adapts the usage of a period, [.], to separate syllables and a colon, [:], to mark a long vowel.

[14] http://en.wiktionary.org/wiki/Wiktionary:Frequency_lists/Icelandic_wordlist accessed 11/04/2013

2) *Bjóða* [pjou:.ða] 'to offer' *bauð* [pæy:θ] 'offered'

(Árnason, 2011, p. 107)

The distribution can be shown as follows:

Table 0.1 Complementary distribution of dental fricatives

/θ/			/ð/		
#	_	C,V	V	_	V
C,V	_	#	V	_	C[+Voiced]
C,V	_	C[-Voiced]	C	_	V

There are some post-lexical rules in vernacular Icelandic that are of importance for this study. Árnason mentions the tendency for intervocalic voiced fricatives (e.g. *taða* [t^{h} a:.ða] 'type of hay') to weaken to approximants (e.g. [t^{h} a:. ð̞a]/[t^{h} a:.i̯]) or simply to be deleted (e.g. [t^{h} a:.a]/[t^{h}a:]) (2011, p. 169). The voiced fricative seems to be less affected when in word-internal coda-position as in *veðja* [vɛð.ja] 'to bet' (Árnason, 2011, p. 170).

This lenition process can also be observed in word initial onsets, where the voiceless dental fricative can sometimes undergo a debuccalization to [h] as well as full deletion (Árnason, 2011, p. 294).

3) *Það er bara það* [θaθ.eɾ̥.pa:ra.θaθ] 'it's just like this'

Becomes *þa'bara'ða* [ha:.para.ha.]

The connection between voicing of dental fricatives and position within the lexical unit is also apparent when looking at resyllabification processes, which are frequent

in spoken Icelandic. One effect of resyllabification is that a word final consonant can form the onset of a following syllable that does not have an onset:

4) "... *fer í bólið á kvöldin* ['fɛr.i.'pou:lIθ.au.'k^{h} væltIn] 'goes to bed at night'

Becomes ['fɛ:.ri.'pou:lI.ðau.'k^{h} væltIn]

(Árnason, 2011, p. 147)

In this case, the final coda of *bólið,* 'bed', becomes the onset of *á,* 'at'. The dental fricative becomes voiced in the process as it is treated as an internal onset instead of as a word-final coda.

There is a similar effect when looking specifically at pronouns. Árnason notes that pronouns in Icelandic can be cliticized (Árnason, 2011, p. 263). As the clitication has an effect on the syllable position, making the word-initial onset word internal, this entails a voicing of an otherwise voiceless dental fricative when in word-initial onset position. This is important as a good portion of pronouns and adverbs in Icelandic have a [θ] in the onset position, e.g. *þar* [θa: ɽ] 'there', *þeir* [θei: ɽ] 'they'.

5) *Eru þeir farnir?* [e.ru.θeiɽ.faɽ.niɽ] 'Are they gone?'

Becomes [e.ru.ðeiɽ.faɽ.niɽ]

This voicing of voiceless dental fricatives is stylistic, related to faster, more slurred speech (Árnason, 2011, p. 293). Stylistic variation, as has been mentioned, should show effects of social factors. This argues for the inclusion of this variable in the study, i.e. stylistic voicing of voiceless dental fricatives in word initial onsets and word final codas.

In sum, dental fricatives show variation related to style, which is promising for sociolinguistic investigation. There is both a general deletion effect and a voicing effect of word initial onset and final coda positions.

section 1.4: summary

Icelandic is traditionally perceived to be a stable language with little or no variation related to status, social class or other easily recognizable social factors.

Previously studied morphosyntactic variables in Icelandic have not produced statistically robust results for the task of describing and explaining variation in a sociolinguistic context due to the paucity of tokens in natural (non-elicited) data (e.g. F. Friðriksson, 2008). To render them viable would require more extensive linguistic corpora than is feasible for a study of this size. No study has looked specifically at a phonological dependent variable for a sociolinguistic study on Icelandic, even though as Árnason notes: "the phonological history [of Icelandic] is more interesting [than the grammatical one] since more has happened over time in the phonology than in the morpho-syntax" (2011, p. 4), and that phonological variation is often seen as the main tool in hierarchisation of langue use (e.g. Gadet, 1997, p. 78). The main reason for this has been the apparent lack of phonological variation in vernacular Icelandic given that historically known features of dialectal variation have all but disappeared, rendering them unsuitable for a study of current linguistic practices.

Dental fricatives have not been the subject of any previous linguistic studies of Icelandic, nor do they play an apparent role when native speakers evaluate spoken Icelandic. However, it has been shown that dental fricatives do have the potential to show structured variation based on internal, linguistic, factors in the vernacular language. Context dependent voicing as well as deletion, both of which can be related to style, may also vary in relation to external, social, factors.

Their use fits well into the general sociolinguistic framework for studying a speech community, as previous research has often focused on such deletion/variation processes, as for example the (ing) variable in English (Labov, 1973) or the coda /s/ deletion in Spanish (Erker, 2012).

This study proposes to examine variation in the production of dental fricatives with the aim of investigating: a) the indications of a linguistic boundary shown in previous judgement tests, distancing the western part of Reykjavík from the rest of the population; and by extension b) whether the expected variation in dental fricatives is a robust enough variable to merit further attention. It tests the hypothesis that dental fricatives show linguistic constraints in vernacular Icelandic and that the Icelandic speech community shows typical socially-driven variation in their use.

CHAPTER II
METHODOLOGY

This chapter outlines the methodological constraints for a quantitative study on the Icelandic speech community using variation in the production of dental fricatives as a sociolinguistic variable. It starts with the constitution of the corpus, the methodology used to recruit the informants and the context from where the tokens are extracted. This is followed by the method used for identifying possible tokens and the criteria for the classification of the apparent surface forms. The chapter then looks at the independent variables, internal and external to language, used in analysing and describing the community and finishes with a short summary.

section 2.1: criteria for the corpus

section 2.1.1: recruitment of informants

Data for this study were derived from a corpus consisting of recordings of standard sociolinguistic interviews conducted in Icelandic during the summer of 2013 (e.g. Labov, 1973, 1984; Tagliamonte, 2006, 2012). The corpus sample was constructed using a variant of the 'friend-of-a-friend' approach for recruiting informants, where the researcher is put in contact with a possible informant by an acquaintance of the latter. Milroy (1987, p. 53) claims that this creates a personal link for the informant to the researcher, making him more likely to accept to participate in the study, and to use a less formal style of language, predominantly uninhibited language production. It also gives the researcher an enhanced control over the constituency of a corpus as opposed to the random sampling method, as it is possible to select informants who best fit the research criteria.

The Reykjavík area was split into east and west at the Elliðaár river in line with previous indications of a possible boundary within the community (F. Friðriksson, 2008; Maling & Sigurjónsdóttir, 2002). Furthermore, in order to test whether the western part behaved differently from the rest of the country, a smaller control group from outside of the greater Reykjavík area was created. During sampling, preference was shown for informants who had grown up in the same sector (Reykjavík east, west or outside of the greater Reykjavík-area) as they lived in. This was possible for all but the older informants in eastern Reykjavík (as the area had not been developed until the 1960s).

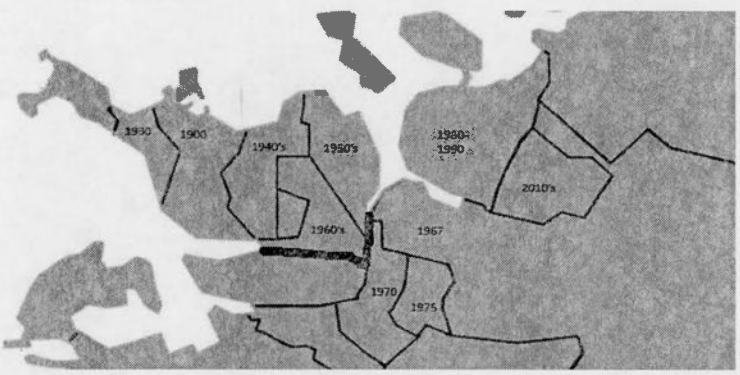

Figure 0.1 Map of Reykjavík split into West and East with approximate founding of each neigbourhood

The corpus is balanced for sex, since sex has been shown to be an influential conditioning factor across sociolinguistic studies (e.g. Eckert & Rickford, 2001; Labov, 1973). Age is another factor typically identified as affecting variation in sociolinguistic studies (e.g. Sankoff & Blondeau, 2007) and as such, age was built into the sample design for the corpus. To ensure a consistent age spread in all area-groups, the corpus was split into three discrete age groups, 18-35, 36-55 and 56-80 years old. Finally, in order to minimize the effect of the individual on the corpus, two informants from each criterion were recruited. The corpus therefore consists of a total of 33 informants with Icelandic as their first language, 17 males and 16 females, with

24 informants from Reykjavík and 9 from outside of the greater Reykjavík area.[15] Table 2.1 shows the distribution of the corpus.

Table 0.1 Distribution of informants according to age group, area of residence and sex

	Western Reykjavík		Eastern Reykjavík		Countryside		Total
Age	Male	Female	Male	Female	Male	Female	
16-35	2	2	2	2	1	1	10
36-55	2	2	2	2	2	1	11
56-80	2	2	2	2	2	2	12
Total	6	6	6	6	5	4	33

Initial contact with the informants was made by a recruiter acting on behalf of the researcher (usually a mutual acquaintance of theirs and the researcher), seeking permission for the researcher to contact them about possibly participating in a study. The recruiter presented the study as a one of social changes in Iceland since the middle of the 20th century, specifically the way these can be seen in the everyday interactions and language used by Icelanders.

This emphasis on language use, attitudes, perception, etc., in the social environment of the informants was reiterated when the researcher then contacted the possible informants. This approach was inspired by the methodology of studies in Belfast (Milroy & Gordon, 2003, pp. 75-76) and Toronto (e.g. Tagliamonte, 2012), where, in order to minimize the effects of the observer's paradox, the researchers portrayed the language as one of many factors under study (which strictly speaking, it is[16]). As in Belfast, this "rather vague account satisfied and stimulated the interest of most

[15] The control group lacks three informants due to an inherent construction problem. Most of the control informants recruited were agriculturally based, from a small county were most young people leave to seek education, and pursue careers or opportunities elsewhere. The social network of the county did not provide enough young informants that fit the criterions of the study to attain the number of two informants per age group per sex.

[16] "[...] language can be mentioned as one of many aspects of the study – an accurate description in view of the role that social information plays in sociolinguistic analysis." (Milroy & Gordon, 2003, p. 80)

people" (Milroy & Gordon, 2003, p. 77). All of those that agreed to be contacted by the researcher accepted to participate in the study.

Permission to record the interviews was requested for ease of analysis. All informants accepted to be recorded. The interviews were recorded using a tripod-mounted Zoom H1 portable mini digital stereo recorder, at 16-bit/96 kHz quality, on an automatic record level, adjusting the volume according to whether the informant spoke softly or loudly. The recorder was placed in sight of the informant, so as to minimize any disparities between interviews related to difference in formal/informal speech due to the recorder and in order to maximize quality of the recording for phonetic analysis.

section 2.1.2: interviews

The interviews were based on an interview schema adopted from Tagliamonte (2006). The interviews were conducted individually at a place that was familiar to the informant, usually at the informant's home, in order to make them feel at ease. The interview started with an open-ended discussion, based on the interview schema (a list of subject matters covered by the interviews, including example questions, is given in Appendix A), of about 30 to 45 minutes. This part of the interview was used to collect demographic information about the informant, e.g. age, education, family history, etc. Thus the casual discussion was directed towards growing up in Iceland, family history, etc., where anecdotal stories were elicited in order to gather informal speech. This was usually done without aid from the interview schema as discussions related to the demographic information generated in most cases enough output, as it did in Belfast (Milroy & Gordon, 2003, p. 76). This was then followed by a formal questionnaire (see Appendix B) of about 20 to 30 minutes that was specifically pertaining to language, language attitudes, perception of Icelandic as a stable language, etc. The informants were finally asked to mark on a map the parts of

Reykjavík where they would prefer to live and where they would the least like to live, accompanied with a discussion about their preferences.

The formality of the language questionnaire was emphasized both at the beginning of the interview, as well as at the end of the informal part, beginning of the formal questionnaire. The clear distinction made between the two portions was intentional, as one of the aims of the study is to confirm if there was any stylistic difference in relation to the attention paid to speech. As the informants were made aware that a formal questionnaire about language followed the informal discussion it was hoped that they would subsequently concentrate more on their output during the formal questionnaire, while they would relax their attention to their output during in the informal discussion.

section 2.2: coding

Token extraction was conducted using two separate sections from the interviews, from the informal discussion and from the responses to the formal questionnaire. The tokens for the informal discussion were taken from 10 minutes into the recording and onwards in order to minimize the effect of the observer's paradox (e.g. Labov, 1973). The second interval began with the answer to the first question in the formal questionnaire. Earlier studies have shown that the effect of the observer's paradox diminishes about 5 minutes into the interview. By excluding the first 10 minutes, the corpus should represent as informal a language as is attainable under the circumstances of a sociolinguistic interview. It was hoped, by extracting from the very beginning of the formal questionnaire, that the informants would be forced back into a formal language context, paying more attention to what they were saying.

The tokens were extracted and coded manually. Information about the linguistic and social context relevant to describing the factors constraining the variation were coded for statistical analysis, this included internal factors, i.e. linguistic constraints, as well

as external factors, social constraints. Tokens for the study were extracted auditorily, with each token verified visually on a spectrogram through the PRAAT acoustic analysis software package (Boersma & Weenink, 2013). The internal factors pertinent to describing the variation, which will be described further in the next subsection, were word type, pronunciation, position in the syllable, preceding and following environment, and type of word used. Standard social factors incorporated into the analysis included age, sex, and status. Additionally, several factors deemed relevant to the speech community of Iceland were also included, such as area of residency within the city and how long the informant's family had lived in the city.

section 2.2.1: instrumentally based auditory identification of tokens

Erker points out that "*'perceptual coding'*, by definition, is dependent on perceptions of researchers, each with her or his own sociolinguistic background". This creates problems when it comes to studying speech production as "the expectations and experience of listeners and also linguistic factors such as surrounding phonetic context can significantly affect perceptual categorization of speech sounds" (2012, pp. 28-29). Because of this, Erker argues for the use of quantifiable methods when coding *speech production*, using the physical properties of the acoustic signal, as described through the computational characteristics the phonemes displayed in a soundwave and spectrogram, to identify tokens.

Milroy and Gordon point out that a discrete, quantifiable difference in the acoustic signal does not necessarily fulfill a function for a member of the speech community, even if it can be measured. They emphasise the importance of "establishing that the differences identified by the analyst are in fact the same ones that are relied upon by members of the speech community" (Milroy & Gordon, 2003, pp. 150-151). Erker is aware of this as he makes a point of referring to speech production and not speech

perception in his arguments. This means that the linguistic capital[17] (i.e. the cultural status it gives the speaker) invested in the use, or omission, of a particular variant of a specific variable in the speech of a given informant, is not under study in Erker's approach. He is studying the form of the linguistic output, irrespective of how it is perceived.

An important contribution of instrumental identification and coding is its role in improving the consistency of the research methodology (see Erker, 2012, p. 48) and the replicability of instrumental coding. Milroy and Gordon admit that this is where auditory identification of tokens leaves much to be desired. The researcher must, in order to minimize the risk of inconsistency in the coding process, either increase the number of tokens used for analysis, so as to minimize the effect of incorrect identification, or use multiple coders for the same set of data so as to verify consistency in coding (Milroy & Gordon, 2003, p. 151). Both of these methods require extra time in contrast to the instrumental approach, as the acoustic measurements derived from the sound wave remain constant. Thus, extracting and coding of phonetic data through instrumental identification and measurement is arguably preferable for the study of phonological variables due to potential time saving, as well as the inherent consistency of the instrumental approach.

The study of dental fricatives poses a number of challenges which must be factored into a study of dental fricatives. Fricatives in general do not have a consistent noise spectrum in natural speech due to variance related to the phonetic environment (Mann & Repp, 1980, p. 213). However, they do have a "continuous acoustic output throughout [the] production" (Zhao, 2010, p. 2010). In his review of the acoustic properties of fricatives, Erker cites that they can be identified in spectrograms by "aperiodic energy in a mid-high frequency range that extends throughout their

[17] For an introduction to the construct of the *linguistic marketplace* and the role of language in the symbolic power an individual can wield see for example Gogolin (2001).

production", and that voiced fricatives also exhibit vertical striations indicative of voicing (Erker, 2012, p. 50).

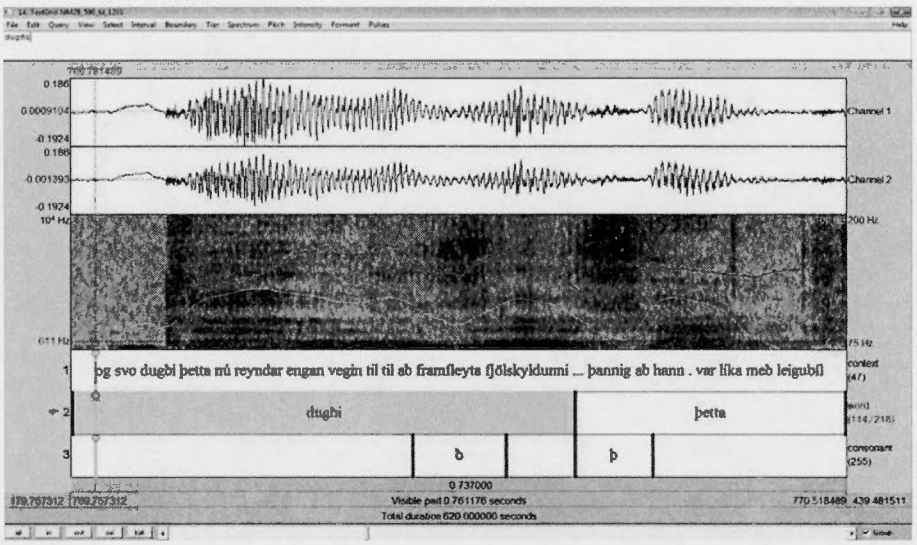

Figure 0.2 Example of dental fricative confirmation in PRAAT

With this in mind, it is possible to establish principles for a coherent token extraction protocol consistent with Labov's principle of *accountability* (1984). Initially, all pronounced lexical items predicted to contain a dental fricative according to standard pronunciation were identified as per Erker (2012, p. 39). Subsequently, tokens meeting the criteria for exclusion that are discussed below were excluded. Valid tokens were coded into discrete categories (as per File-Muriel (2010, p. 6)) with respect to the surface form they appeared in. Tokens were verified for either the presence of voicing striations for examples of /ð/, or for aperiodic energy in the mid-high frequency range for examples of /θ/. If neither of these acoustic signatures, nor any of the non-standard variants (voiceless glottal fricative /h/, stop-like pronunciations /t^h/, /d^h/, etc.) then the token was coded as deleted. Phonetically pronounced tokens were coded for the surface form they appeared in. Voiced and voiceless dental fricatives, /ð/ and /θ/, were coded separately and all non-standard

ways of pronouncing were coded as a class, contrastive with both voiced and voiceless dental fricatives.

Table 0.2 Categories for coding of variable 'Pronunciation'

Pronunciation	/ð/
	/θ/
	Ø
	Other productions (/h, t, t^h /, etc.)

Deferring to the principle of accountability, it is necessary to exclude some tokens from the corpus. This must be done in a consistent manner, specifically with respect to syllable reduction. Syllable reductions are common in Icelandic. The last vowel of a word is for example often deleted if followed directly by another word (e.g., the phonetic reduction process of *apocope)*:

6) *Farðu ekki* [far.ðu.e khI] 'don't go'

Becomes *farð'ekki* [far.ðe.k^hI]

(Karlsson, 2004, p. 16),

This creates a resyllabification resulting from merger of the adjoining syllables. A similar process is enacted in prosodically weak, word-internal syllables.

7) *Miðvikudagur* [mIð.vI.kY.ta'.ɣuɾ] 'Wednesday'

Becomes *mið'g'dagur* [mIð.kta'.ɣuɾ]

(Árnason, 2011, p. 294).

Tagliamonte emphasizes that syllable reduction processes are "likely to be under the influence of independent processes of grammaticalization" (Tagliamonte, 2012, p. 197). This suggests that there is another deletion process taking place at the level of

the syllable, and not of the phoneme. This is therefore a process that is beyond the scope of this study.[18]

With this in mind the following guidelines were created:

- Words where syllable reduction affected the token syllable were excluded (*maður* [ma:.ðuɽ] - *ma'r [maɽ] 'man, one (pronoun)'). If the syllable reduction did not directly affect the token syllable (*svolítið* [svo.li.tʰIð] - *soldið* [sol. tʰIð] 'little bit'), or the syllable reduction (as per footnote 16) was a part of a cliticization process (*fara þaðan* [fa:.ra.θa.ðaɳ] – *far'aðan* [far.a.ðaɳ] 'go from there'), then the token was kept.
- Words that were not clearly audible were excluded. Reasons for lack of audibility could be background interference, mumbling or rapid pronunciation, bad quality of recording, etc. (Milroy & Gordon, 2003, p. 162)
- Due to problems of separating the previous phoneme from the second (Mann & Repp, 1980, p. 222; Tagliamonte, 2012, p. 196), tokens followed by a fricative were excluded.

section 2.2.2: internal variables

This section details which linguistic constraints are addressed in this study. Tokens were coded for word category, number of syllables in the word, the position of the phoneme in the word, preceding and following environment and lexical frequency.

The morphological category of the word has been shown to have an effect in phonemic deletion processes (Erker, 2012; Tagliamonte, 2012, p. 181) and in deviation from standard pronunciation (Wieling, Nerbonne, & Baayen, 2011). The tokens were for this reason coded for the function of the word category; lexical words

[18] Árnason nevertheless argues that the deletion of a word final syllable in front of a phonologically cliticized pronominal and adverbial forms without an onset follows on the deletion of the onset (Árnason, 2011, p. 263). This he relates to stem final vowel deletion in front of a suffix vowel.

were coded by category as noun, verb, adjective and numbers, while function words were coded together as a class. Due to the preponderance of pronouns in the corpus, they were ultimately coded separately.

Table 0.3 Categories for coding of variable 'Syntactic category'

Syntactic category	Noun
	Verb
	Adjective
	Pronoun
	Numbers
	Other function words

Erker notes that /s/ in Spanish is known to weaken in polysyllabic words (Erker, 2012, pp. 15-16). This has been linked to the amount of information each phoneme needs to carry for lexical access, i.e.the more phonemes in a word, the less necessity to pronounce them all in order to access the information the word contains (File-Muriel, 2010, p. 14). It could therefore be hypothesized that dental fricatives would show a more pronounced tendency to be deleted in longer words. Hence, the tokens were coded for number of syllables in the word. Words with more than 3 syllables (a total of 58 tokens) were treated as a single category.

Table 0.4 Categories for coding of variable 'Number of syllables'

Number of syllables	1 syllable
	2 syllables
	3 syllables
	4-7 syllables

Given the importance of position of the dental fricative in the word for both deletion and for voicing, as discussed in Section 1.3.1 above, syllable position was also coded for as an independent variable:

Table 0.5 Categories for coding of variable 'Syllable position'

Syllable position	Simple Onset
	Complex onset
	Word initial onset
	Complex word initial onset
	Coda
	Word final coda
	Complex coda

The phonological environment of a token has been shown by previous studies to affect variation for phonological variables (e.g. Bybee, 2002). Consonants were coded as either voiced or voiceless in keeping with the objective of this study to examine voicing of underlyingly voiceless dental fricatives. Tokens with a fricative in the following segment were excluded, as discussed in section 2.2.1., but not tokens with a fricative in the preceding segment. Fricatives were therefore coded separately when they appeared in the preceding environment.

Tagliamonte raises a question about which environment to examine, the underlying phonological context or the surface phonetic environment (Tagliamonte, 2012, p. 201). In her study on /t/ /d/ deletion in English Tagliamonte coded for both but assumed that the underlying context conditioned the deletion. This problem affects, for example, utterances where function words are omitted in vernacular speech (particularly *að*) which are required by standard grammar (*ég hugsa að ég fari ekki í skólann – ég hugsa Ø ég fari ekki í skólann* 'I think I won't go to school'). This means that a judgement must be made as to whether the underlying form of the sentence contained those words or not, a decision which is arguably subjective and arbitrary without any data to motivate the choice. Introduction of underlying syntactic forms meant a subjective interpretation of what underlying forms the informants

were using, introducing a possible bias into the study. This study, for this reason, uses the surface form for analysis, excluding tokens in which the informant has deleted the whole word:

Table 0.6 Categories for coding of variable 'Preceding environment'

Preceding environment	Voiced fricative
	Voiceless fricative
	Vowel
	Other voiced consonants
	Other voiceless consonants
	Pause

The coding for following environment follows on the same reasoning as for the preceding environment, except that fricatives were excluded as was noted in Section 2.2.1:

Table 0.7 Categories for coding of variable 'Following environment'

Following environment	Vowel
	Voiced consonants (excluding fricatives)
	Voiceless consonants (excluding fricatives)
	Pause

The effect of lexical frequency on sound change is controversial.[19] However, lexical frequency does seem to serve an amplification role, for example, for use of pronoun (Erker & Guy, 2012, p. 527) or deletion of word final /t/,/d/ consonants in English (Bybee, 2002, p. 278). Bybee claims that processes of phonetic change seem to affect high-frequency lexical items earlier than lower-frequency words (e.g. Bybee, 2002, pp. 270-271). The data is therefore coded with this in mind, with word forms with a greater portion than one percent of total tokens considered to be frequent. This number is justified in section 2.2.2.1 below.

Table 0.8 Categories for coding of variable 'Frequency'

Frequency	Frequent (>1% of corpus)
	Infrequent (<1% of corpus)

section 2.2.2.1:two samples

The task of disentangling lexical frequency effects presents a further methodological problem, as highlighted by Milroy and Gordon. Imposing token count cut-offs for each lexical item extracted for in the data of each informant included in a data sample may impact the researcher's ability to understand subtle complexities of the language internal context. If no limit is set, however, then a lack of diversity in the phonological context might hinder a fuller understanding of the social context of the variation. As Milroy and Gordon observe, "it may be difficult to disentangle

[19] Though Labov (e.g. 1994) argues that lexical frequency does not have much of an impact on variation, advocates for the significance of lexical frequency effects have been growing in number recently. It has been argued that lexical frequency effects are less readily apparent in spontaneous speech (what Labov terms the "vernacular") "due to the near-exclusion of lexemes that belong to the lower range of the frequency scale"(File-Muriel, 2010, p. 2). Lack of consensus as to whether lexical frequency plays a significant role in language variation and change may stem from the complexity of the phenomenon. High frequency seems to have different effects on phonological and morphological variables. Thus it appears to favour phonetic changes but disfavour grammatical ones (Bybee, 2001, p. 12; Erker & Guy, 2012, p. 528).

phonological from lexical patterns if the pool of data is dominated by a limited number of words" (Milroy & Gordon, 2003, p. 163). The methodology of this study, attempts to strike a balance between these two methodological positions.

It has been stated that a minimum of 30 tokens is needed for a robust multivariate statistical analysis (Milroy & Gordon, 2003, p. 164), but this low number poses a problem when looking at the effect of lexical frequency due to the disproportionate frequency of the most common words in the sample. The online corpus of modern Icelandic, *Íslenskur orðasjóður*[20] offers insight into the lexical frequency problem. The 15 most common word forms in the speech data of the informants included in the study sample account for 10 percent of the *Íslenskur orðasjóður*-corpus. However, these 15 word forms account for over 70 percent of the valid tokens in the sample if no frequency restrictions are imposed. Thus, if the objective is to obtain approximately 30 tokens per informant for both the 'frequent' and 'infrequent' groups (irrespective of speaking style), then a limit of 60 tokens (30 'frequent' and 30 'infrequent') per informant is too restrictive.

Following Erker and Guy (2012), an additional sample from the dataset (henceforth Sample A), designed to account for this requirement for a higher token count, was included in order to perform a separate, parallel analysis.. External social factors such as area of residence or sex of the informant were judged as not relevant to analysis of Sample A as it was included strictly to test for lexical frequency effects on deletion of dental fricatives. Therefore only the 12 male informants from Reykjavík were sampled, beginning at the same point in the interviews as for the lower token count sample, henceforth Sample B, (which therefore partially sampled the same tokens). A total of 140 tokens was extracted from informant, 100 from the informal discussion and 40 from responses to the formal questionnaire, for a total of 1680 tokens.

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[20]The *Íslenskur orðasjóður* corpus forms a part of the Leipzig Corpora Collection. It is an extensive online corpus of written Icelandic, with 545 million words and 6.7 million different word forms. Found at http://wortschatz.uni-leipzig.de/ws_isl/

Style is a language-external, social factor. The frequency count dataset, Sample A, does not have to account for it. However, in hopes of more accurately representing the actual lexical frequency, a portion of the tokens from Sample A was nevertheless extracted from the formal questionnaire in order to ensure greater diversity in the topics under discussion.

This dataset serves as a base for a raw frequency count. The number of times each lexical unit (e.g., the standard, dictionary citation form of the word) appears in the dataset is divided by the total number of tokens in Sample A. This percentage then serves as the measure of lexical frequency. Erker and Guy argue for a relatively high threshold for the high frequency criteria, as they find more robust effects where inclusion in the group of frequent items is more restrictive (Erker & Guy, 2012, p. 550). Following their argumentation, a single lexical unit had to account for more than one percent of the tokens in Sample A in order to qualify as frequent.

Constructing this subset of the data to account for lexical frequency means that there is no need to analyze frequency in the larger sample. The whole dataset was therefore sampled (Sample B) with a maximum limit of two occurrences per lexical item (word surface form), per informant, per speaking style, resulting in a count of 60 tokens per informant, or a total of 1980 tokens. This sample was designed to permit analysis of the social constraints and to increase diversity in word forms used. This restriction was imposed to offset effects of high frequency word forms as well as minimizing the aleatory effects of unique occurrences of a word. This means that, for example, *þú* [θu:] 'you (2p. sg. nominative)' and *þig* [θiɣ] 'you (2p. sg. accusative)' are treated as separate word forms as they have different phonetic forms, despite the fact that they represent the same morpheme. Following the same logic, the homonyms *við* [viθ] 'by', *við* [viθ] 'we (nominative)' and *við* [viθ] 'wood (accusative)' are treated as different word forms even if they have the same phonetic form, as they represent

different morphemes that serve different grammatical purposes.[21] The two samples, Sample A and B, are taken from the same points in time within the interviews which means that there is a considerable overlap in tokens between them. The two samples within the dataset are illustrated in table 2.9.

Table 0.9 Caracteristics of Sample A and Sample B

Sample A: Lexical Frequency	Sample B: Restricted Frequency
Only male Reykjavík informants (12)	All informants (33)
Western & Eastern Reykjavík	Western & Eastern Reykjavík & Country
140 tokens per informant (100 & 40)	60 tokens per informant (30 & 30)
Total tokens in corpus 1680	Total tokens in corpus 1980
All valid occurrences per word form allowed	A restriction of max 2 occurrences per word form per interview portion

The frequency of dental fricatives in spoken Icelandic means that extracting an adequate number of tokens was not problematic. It was generally possible to collect the 30 tokens for Sample B from each portion of the sociolinguistic interviews from around 3 minutes of spoken language, e.g., there were around 10 valid occurrences per minute. This number was achieved while taking into account the restrictions and exclusions adopted for this study.

section 2.2.3: external variables

This section details the external, social constraints that the dataset was coded for: age, sex of the informant, occupation, education, housing, how long the family of the informant has lived in Reykjavík, the area the informant grew up in, where the informant currently lives, and finally, the part of the interview the token was taken

[21] NB.They were counted as the same word form when calculating the lexical frequency.

from, (i.e. from the informal discussion about life in Iceland, or from the more formal language questionnaire).

Age and sex are obvious choices for independent variables, as these factors were instrumental to the design of the corpus, as discussed in Section 2.1.1. Age is a significant factor for analysis in variationist sociolinguistic studies, (e.g. Sankoff & Blondeau, 2007; Thibault, 1997) whether in relation to age-grading or as an indication of a change in progress. Age is used as a continuous variable ranging from 18 to 74. Sex of informant has consistently been shown in the literature to have significant effects on language variation and change (e.g. Eckert & Rickford, 2001; Holmquist, 1985; Labov, 1973):[22]

Table 0.10 Categories for coding of variable 'Sex'

Sex	Male
	Female

It has been noted that social class is not always appropriate as an analytical tool due to the implications of gradiency that it evokes (Milroy & Gordon, 2003, p. 43). However, where it can be adopted to the society under study it often does show an effect on the variable that is studied (Gadet, 1997). As such, it can be used as a way to "model the socioeconomic hierarchy of a community" rather than as a portrait of identifiable social classes in the society (Tagliamonte, 2012, p. 25).

It has been noted that occupation is the most important component of social class (Ash, 2002, p. 419) and that this facet of class can be substituted for a more complex, compound construction of social class as an independent variable. This study

[22] Correlations found with sex are often better understood when looking at gendered identities (e.g. Bucholtz, 1999). In this line of thought, using 'gender' as a dependent variable would give more nuanced results (e.g. Eckert, 2008) than 'sex'. This derives from the fact that 'sex' is an easily identifiable biological trait, whereas 'gender' is a more nuanced, socially constructed phenomenon that takes into account a more careful analysis of each informant's individual identity. Nevertheless, this requires a more in depth study of the informants than a survey study of this kind cannot easily attain.

therefore adopts occupation as an independent variable representing the dimension of social class. A six point socioeconomic status scale is adopted as a model for the occupation variable. This scale was created to by Björnsson, Edelstein, and Kreppner (1977) to account for the social structure of the Icelandic society and was used in a previous linguistic study in Iceland (Thorlindsson, 1987):

Table 0.11 Categories for coding of variable 'Occupation'

Occupation	1	Non-skilled manual workers, i.e., day laborers, sailors, taxi drivers, unskilled foremen, pensioners, and persons on social welfare
	2	Skilled manual workers and artisans.
	3	Non-skilled clerical workers.
	4	Technical workers, lower managerial workers, and elementary teachers.
	5	Independent business proprietors, directors and managers in business and industry.
	6	Professionals with academic education; teachers at upper levels of high schools and the university level; higher officials in central and local government).

(adopted from Thorlindsson, 1987, p. 702)

As previous research on Icelandic morphosyntax has shown a dependency on education (Svavarsdóttir et al., 1984 inter alia), it will be retained as an independent variable for this study. The following classification used by Maling and Sigurjónsdóttir will be adopted:

Table 0.12 Categories for coding of variable 'Education'

Education	1	Compulsory education (10th grade)
	2	14 years of schooling (*menntaskóli*[23] and journeyman's certificate)
	3	University level

(adopted from Maling & Sigurjónsdóttir, 2002, p. 115)

[23] A non-compulsory four-year program required for studies at a University that is roughly equivalent to the junior college Cégep system in Quebec.

Municipal authorities in Reykjavík have actively encouraged homeownership (Bernharðsson, 1998) and have done little to promote a healthy rental market within the city (Bernharðsson, 2000). Hence, the type of lodgings an individual can afford will typically reflect that person's income (and social standing). In a supposedly homogenous society, this might give access to quantifiable evidence of social differences that might not otherwise be readily apparent. The weighted score attributed to each neighbourhood is derived from the median price per square meter of floor space for apartments in each neighbourhood as published in the National Registry of Iceland.

Table 0.13 Categories for coding of variable 'Housing'

Housing	Neighbourhood	1	Low value neighbourhood
		2	Middle value neighbourhood
		3	High value neighbourhood
	Type	1	High rise, etc
		2	Townhouse, 2-3 apartments, etc
		3	Villas

It has been observed that Reykjavík is a city built by, and for, in-migrants (e.g. G. Friðriksson, 1991a; G. Friðriksson, 1991b). The children of in-migrants, born in Reykjavík, are likely to display difference in the use of sociolinguistic markers than their parents (possibly through leveling of the first generation's regional variations) (Kerswill & Williams, 2000). The dataset is therefore coded for the number of generations that the informant's family has resided in Reykjavík. The duration of stay was determined as the first ancestor of the informant to relocate to Reykjavík, the informant, a parent or a grandparent (or older):

Table 0.14 Categories for coding of variable 'Length of stay in Reykjavík'

Family stay	1	First generation
	2	Second generation
	3	Third generation or longer

The dataset is also coded for place of upbringing, whether the informant grew up in the western part of Reykjavík, the eastern part, or in the country, or whether they moved around between areas. This is done in recognition of the hypothesis that the city straddles a probable linguistic boundary (Maling & Sigurjónsdóttir, 2002). A link has also been established between the variant learned in youth and the relaxed informal, vernacular variant spoken when adult (Labov, 1973). If an informant spent a considerable amount of time each year away from home whilst growing up (e.g. stayed with grandparents on a farm over the summer, etc.), then data from that speaker was coded as "mixed":

Table 0.15 Categories for coding of variable 'Upbringing'

Upbringing	West
	East
	Rest of Iceland
	Mix

Data were also coded for the actual place of residence of the informant at the time the interviews were conducted. One of the aims of this study is to confirm whether the two parts of the city behave linguistically in a similar way or not. As stated in section 2.1.2, geographical variation has been hinted at in previous studies (F. Friðriksson, 2008; Maling & Sigurjónsdóttir, 2002).

Table 0.16 Categories for coding of variable 'Area of Residence'

Area	West
	East
	Rest of Iceland

Finally, the tokens were coded for whether they came from the informal discussion or from responses to the formal questionnaire as stylistic variation is a fundamental tenant of sociolinguistic variation (Auger, 1997). Style has been defined as "intra-speaker variation that is not directly attributable to performance factors (in the strict sense) or to factors within the linguistic system" (Rickford & Eckert, 2001, p. 2), and "shared patterns of style-shifting" have been seen as central to establishing constituency within a speech community (Rickford & Eckert, 2001, p. 10). An informal style is considered to be unchecked language production, e.g., vernacular speech register. This is where the question of the observer's paradox (Labov, 1973) and the sociolinguist's desire to observe unchecked language production, i.e. what is used within first-tier social networks, come to the fore.[24]

The observer's paradox points to the difficulty of accessing an informant's informal speech register during a sociolinguistic interview, as the presence of a recording device and the somewhat inauthentic speech context of the interview has a tendency to make people self-conscious about how they are speaking. It is hoped that the friend-of-a-friend approach should give the researcher a better chance of observing unchecked, vernacular language, as this represents his having been admitted to the second-tiers social network of the informant, and thus somewhat distanced from the role of the observer (F. Friðriksson, 2008, p. 151).

The study looks at the variation used in two distinct portions of a sociolinguistic interview. It considers the more relaxed discussion about various subjects as being representative of an informal style, while the answers to a specific fixed questionnaire

[24] This discrete distinction between standard (supralocal) and non-standard language (local) is a simplification that leaves much to be desired. Objections, such as the counter-effect of group dynamics on readily recognizable outside observation (Milroy & Gordon, 2003, p. 67) and the simplistic view of "a single sociolinguistic dimension of non-standard to standard" (Milroy & Gordon, 2003, pp. 157-158) cast doubt on the existence of this dichotomy of vernacular (informal) and standard (formal) language use.

about language to represent a more careful speaking style. This distinction is used as an indication of how Icelandic is used in everyday interactions in Iceland.

Table 0.17 Categories for coding of variable 'Style'

Style	Informal
	Formal

section 2.3: summary

This chapter addressed the recruitment of informants. The sampling method, the friend-of-a-friend approach, was justified as fitting due to the ease of operation and the enhanced accessibility to the vernacular when using it. The chapter then treated how to code the corpus and what to code. The use of instrumentally based auditory identification of tokens was justified due to the consistency of the approach as well as the ease of operation due to its statistical nature. The factors that will be used for the analysis, internal linguistic variables as well as external social variables, were explained and justified with allusions to previous sociolinguistic studies and previous studies of Icelandic.

CHAPTER III
RESULTS

This chapter examines the effect of the independent variables, chosen for this study and detailed in Chapter 2, on the general deletion rate of dental fricatives in Icelandic and on their stylistic voicing at the beginning and at the end of words. The chapter starts with the constraints for the general deletion process of dental fricatives, and goes on to look at the voicing of dental fricatives in word initial onset and word final coda positions. It concludes by synthesizing the results.

Tagliamonte (2012, p. 136) observes that it can be problematic to read statistical models if they include more than six independent variables. Independent variables were therefore restricted to a maximum of 6 factor groups per statistical run. The statistical analysis was done in *R* (Team, 2014) using mixed effects logistic regression with informant marked as a random intercept (as per Tagliamonte, 2012, p. 141) and with age treated as a continuous variable. These steps provide "statistical validation that the linguistic factors are significant over and above the effect of individual" and that it is possible to "be more confident in the statistical significance of age and occupation" (Tagliamonte, 2012, p. 143) Supplementary statistics and analyses were done using the *Rbrul*-package (Johnson, 2009) in *R*. Supplementary ANOVAs, linear regressions, and T-tests were done in SAS for the external factor groups.[25] Each analysis was done with a binary dependent variable, either deletion vs. production or voiced vs. voiceless. Statistical tables (i.e. mixed effects logistic

[25] Using a mixed effect logistic regression to study the external factors proved impracticable due to the small number of informants. Instead, they had to be analysed using ANOVA, T-test and linear regression depending on which independent variable was under study. A higher number of informants would need to be recruited to mitigate this problem.

regression tables, etc), can be found in Appendix C and Appendix D, and cross tabulations in Appendix E.

section 3.1: deletion

Tokens involving deletion amount to almost half of all available tokens, or 802 tokens out of 1679[26] in Sample A and 968 out of 1979 in Sample B. Figure 3.1 shows the distribution of the tokens used for this analysis in the two samples, including phonetically null tokens, voiced and voiceless dental fricatives, and other manners of articulation. This section looks at the distribution of tokens involving deletion and which factors do or do not govern its distribution. The two samples, A and B, do not show a significantly different variation in deletion rates overall (Chi-square p = 0.68318). The analysis, unless stated otherwise, will be based on the numbers from Sample A when it concerns the internal independent factors as it was specifically created to account for the internal variable of lexical frequency.

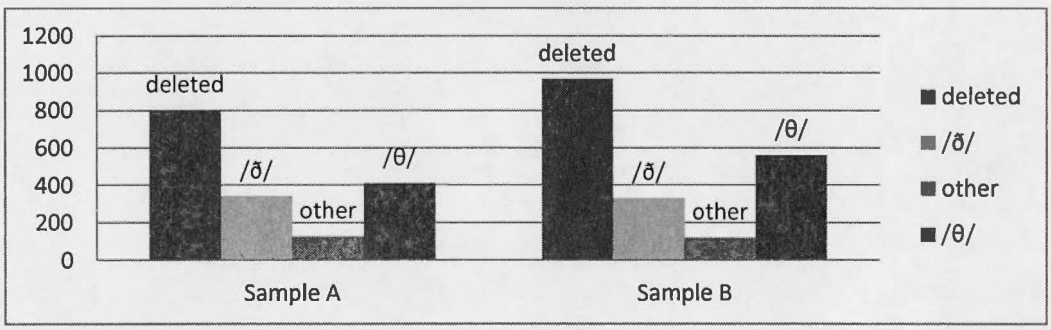

Figure 0.1 Distribution of production in the two samples

[26] One token was excluded as the informant stopped before finishing the word and changed his pronunciation.

section 3.1.1: internal variables for deletion

section 3.1.1.1: deletion and Syntactic category

As has already been mentioned, function words make up a significant portion of the two samples. In Sample A we see that they amount to 78 percent of total tokens, but this number goes down to 67.51 percent in Sample B, where restriction on number of tokens per item was applied. This means that there are on average 30 lexical tokens per informant in Sample A, even though lexical words only comprise represent 22 percent of tokens in the sample. The choice of increasing tokens per informant up to 140 from 60 when looking at the effect of lexical frequency is justified from this perspective.

The question might be posed as to whether this difference in proportions of lexical and function words in the two samples (with a higher proportion of lexical items in sample B) affects the deletion rate between the two samples, for example, do nouns show a higher deletion rate in Sample A than in Sample B? The difference in deletion rates between the two samples within each category is not statistically significant, and the results for both samples should therefore indicate the same effects.

Looking at the deletion rate within each category in Sample A (figure 3.2), we see that use of a phonetically overt variant is preferred in most cases, except when it comes to adjectives and nouns.[27]

[27] Appendix D, Univariate results for internal factor groups 1.1.2.

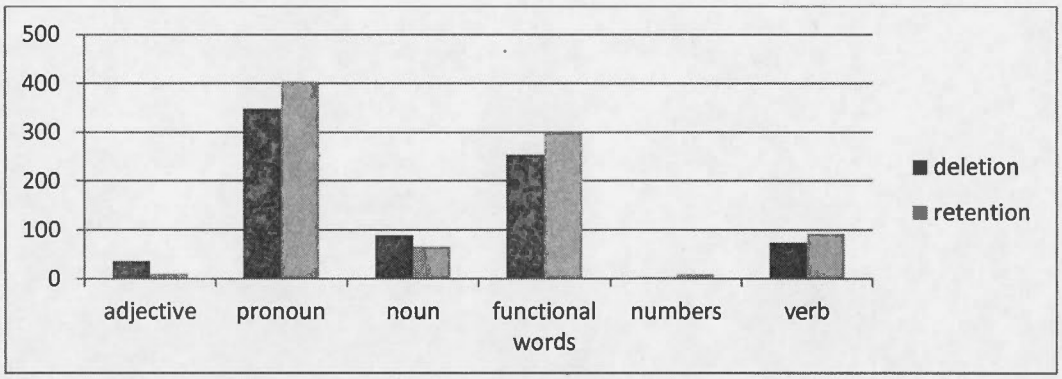

Figure 0.2 Deletion and retention in different word categories

The trend is made clearer when this is regarded as the opposition of function words (pronouns, numbers and other functors) versus lexical words (adjectives, nouns and verbs). Dental fricatives on the whole have a lower tendency to be deleted in function words than in lexical words as can be seen in figure 3.3. This trend was selected as significant at $p = 0.00336$ in Sample A and increases up to $p = 0.00001$ in Sample B.

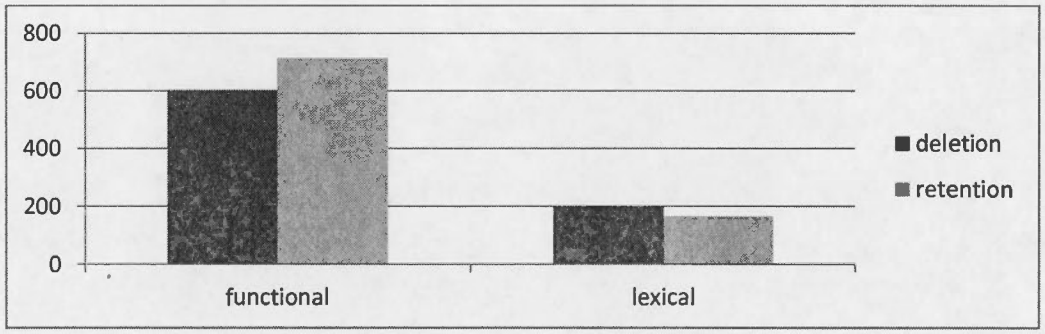

Figure 0.3 Deletion and retention in functional and lexical words

section 3.1.1.2: deletion and frequency

The fact that lexical words have a higher tendency to delete the dental fricative than functional words is a bit surprising. The literature on lexical frequency mentions the relative frequency of function words in relation to lexical words (Erker & Guy, 2012, p. 531) and the fact that frequent items have in general a higher tendency to delete

phonemes than infrequent ones. So it would be expected that higher frequency word forms should show a higher tendency for deletion, which is the opposite of what we see here.

There are 318 different word forms in Sample A, and 62% of them, or 198, appear only once.[28] In total there are only 23 word forms that account for more than 10 tokens each and only 15 that account each for more than one percent of the sample.[29] These 15 word forms are listed in Table 3.1. They account in total for 63.75 percent of the total token count for Sample A.

[28] With a restriction of a maximum of two occurrences per word form in Sample B, the count goes up to 462 individual word forms, with a tail of 307 mono-token word forms (66,5 percent of lexical items), which thus serves as an argument in favour of the restriction in the interest of diversifying the token base.

[29] There are a few things that need to be noted in this context. These words, as expected, are all functional words. The most frequent lexical word in the corpus is the noun *maður* 'man' with 8 occurrences, accounting for 0.48 percent of tokens in Sample A. But *maður* is a particular case, as it taking on the functional category of 1p. plural inclusive, similar to *mann* in Danish or *on* in French, and could therefore be interpreted as a function word. The most frequent verb form is the irregular verb *verið* 'be (imperative plural or past participle)', also with eight tokens. Irregular verbs have been noted for their relative frequency. The first lexical noun is *móðir* 'mother' with six tokens and the first regular verb *þurfti* 'have to past 1st, 2nd and 3rd sg. This might indicate a possible co-linearity of frequency and lexical and functional categories and might introduce an effect into the analysis that is not present in the data (Tagliamonte, 2012, p. 130).

Table 0.1 Distribution of deletion and retention in the frequent vocabulary

Word form		N	%	Deletion %
Það(initial /θ/)	'That'	271	16,13%	17,71%
Það (final /θ/)	'That'	166	9,88%	91,57%
Að	'To'	139	8,27%	83,45%
Þetta	'This'	82	4,88%	57,32%
Þá	'Then, they (accusative)'	77	4,58%	7,79%
Þarna	'There'	61	3,63%	29,51%
Því	'Because'	48	2,86%	6,25%
Þannig	'So'	37	2,20%	5,41%
Eitthvað	'Something'	33	1,96%	81,82%
Þú	'You'	33	1,96%	27,27%
Við	'We, by'	31	1,85%	87,10%
Eða	'Or'	26	1,55%	34,62%
Með	'With'	25	1,49%	76,00%
Þegar	'When'	24	1,43%	0%
Þau	'They'	18	1,07%	11,11%

Sample A shows that if a word is more frequent, then it has a lower rate of deletion (Chi-square p=0.00517) than if it were less frequent (figure 3.4). This seems counter-intuitive given that it has been hypothesized that frequency should increase the rate of phonetic deletion.

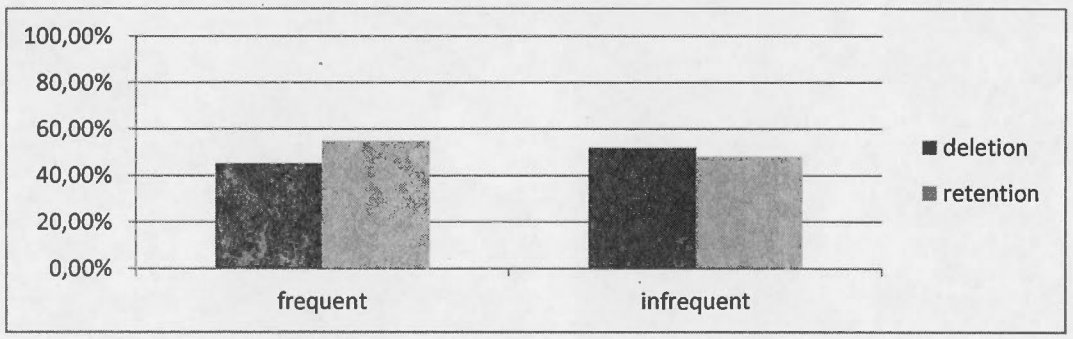

Figure 0.4 Deletion and retention in frequent and infrequent words

A closer look at each of the most frequent words gives a partial explanation for these results. *Þannig*, for example, has a deletion rate of 5,41 percent for the dental fricative while *við*, has an overall deletion rate of 81.82 percent. This opposing trend is well illustrated in *það*, where the dental fricative in word initial onset position has a deletion rate of 17.71 percent while the word final coda position has a deletion rate of 91.57%. This hints at the importance of position in the syllable on dental fricative deletion. This indeed seems to be the case as the frequent and infrequent groups do not have the same distribution between syllable positions ($p = 0.0000$). Infrequent words in the corpus are more likely to have a dental fricative in an internal onset position while frequent words are most likely to have a dental fricative variant in an initial onset and word final coda position. Figure 3.5 shows how they are distributed.

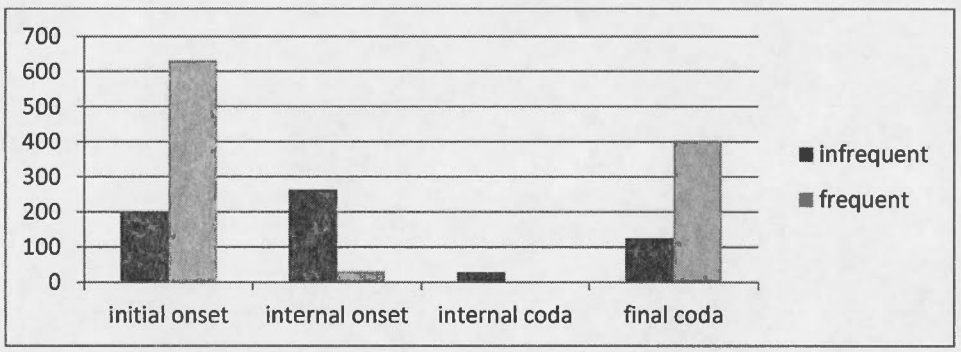

Figure 0.5 Distribution of frequent and infrequent words into syllable positions

section 3.1.1.3: deletion and syllable position

Word initial onset and word final coda tokens constitute the bulk of the dataset, accounting for some 80 percent of the total token count. There are few tokens with complex codas or onsets, accounting for only 13 tokens in total. As a result, these tokens have been merged with their respective simple counterparts for ease of analysis. The distribution of tokens in Sample A according to syllable position is shown in figure 3.6:

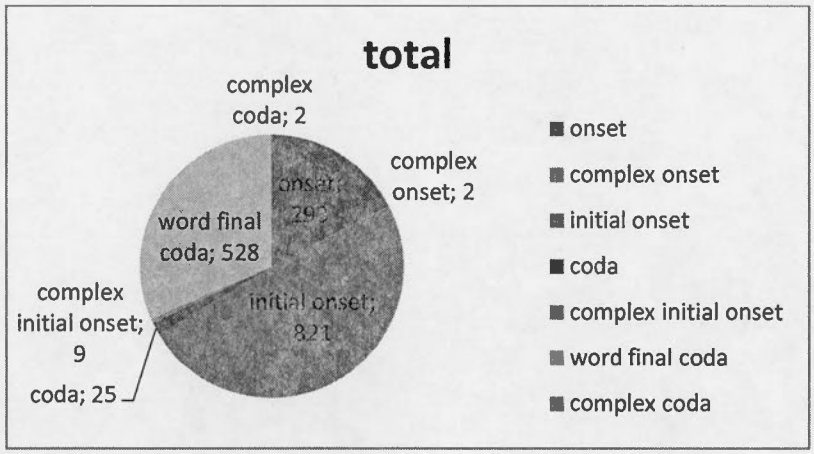

Figure 0.6 Total distribution of tokens into different positions in the syllable

There is a clear tendency for dental fricatives in word initial onsets to disfavour deletion as opposed to in word internal onsets ($p < 0.0000$), as well as a tendency for dental fricatives in word final position to favour deletion as opposed to in word internal position ($p < 0.0000$). Dental fricatives in word internal coda also have a somewhat lower predisposition to be deleted as opposed to the word internal onset position, though this trend was not statistically significant ($p = 0.1455$). This suggests that dental fricative deletion is related to syllabic position as there is a higher probability of deletion in coda position than in onsets and as dental fricatives are more likely to be deleted word internally than in word initial onsets.

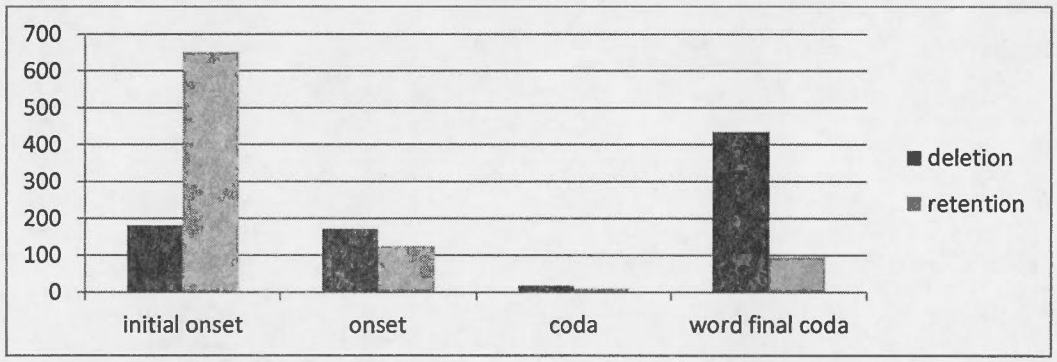

Figure 0.7 Distribution of deletion and retention in different syllable positions

With this in mind, it is possible to revisit the previous question of the effect of lexical frequency on dental fricative deletion. A pattern does appear to emerge (figure 3.8) when the lexical frequency is examined with respect to syllable position. Lexical frequency does correlate significantly with deletion rate in word final coda position ($p = 0.00023$). Frequent words have a slightly lower rate of dental fricative deletion in word initial onset position, but this trend does not meet the threshold of statistical significance ($p = 0.42233$). The relationship between the rate of deletion and internal position seems to be more ambiguous in nature, with infrequently occurring lexical items favouring deletion while frequently occurring items disfavour deletion ($p = 0.00419$). No conclusive generalizations may be drawn from these observations with respect to the effect of lexical frequency on the rate of deletion in word internal positions given that there is only one frequent word with a dental fricative in word internal onset position, *eða* 'or'.

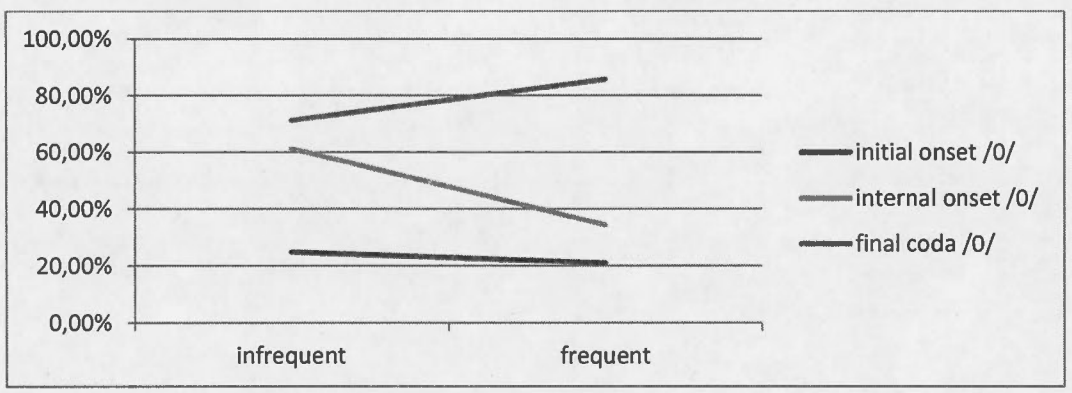

Figure 0.8 Deletion percentage related to frequency for final coda and initial and internal onsets

section 3.1.1.4: deletion and preceding and following environment

Vowels constitute the most frequently attested segment type in the preceding environment factor group, as seen in figure 3.9 below. Only voiced fricatives and pauses in preceding environment significantly disfavour dental fricative deletion ($p = 0.00744$ and $p = 0.00000$ respectively). Univariate analysis of the preceding

environment factor group suggests that a preceding vowel favours fricative deletion ($p = 0.0000$), but this effect disappears from the multivariate analysis.

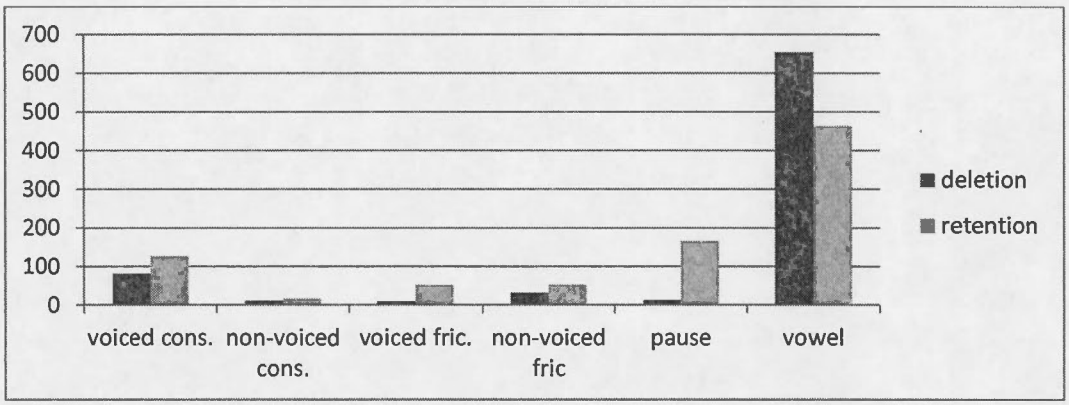

Figure 0.9 Deletion variation related to preceding environment

Analogously to the preceding environment factor group, vowels are also the dominant segment type attested for the following environment, accounting for 79.20 percent of tokens. A following pause disfavours deletion ($p = 0.0000$), as does a following vowel ($p = 0.0241$), but a following consonant (other than the excluded fricatives) favours the deletion variant, as is shown in figure 3.10.

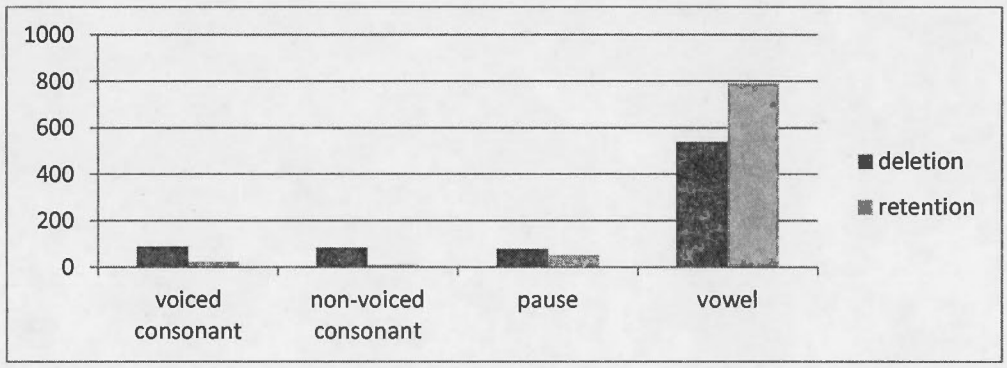

Figure 0.10 Deletion ratio related to following environment

Continuing the discussion of reported effects for preceding and following environment, the context that most strongly favours dental fricative deletion is a

preceding vowel and a following voiceless consonant (other than fricatives). However, these results need to be taken with certain caveats as fricatives were excluded from the following environment. The scope of these effects is further limited due to the amalgamation of positions in the syllable. The importance of syllable position has already been mentioned.

A more nuanced picture comes into focus by attending to the role played by word-initial onset and word-final coda position. It comes as no surprise that vowels are found near categorically following initial onsets (figure 3.11), and there is therefore little practical value to including them in the analysis. On the other hand, there is a more robust variation in the preceding environment of word initial onsets. Deletion is likeliest to occur when following a voiceless consonant, fricatives and others, and voiced consonants other than fricatives (figure 3.12). Pauses disfavour deletion, and a preceding vowel has a tendency to decrease the likelihood of a deletion.

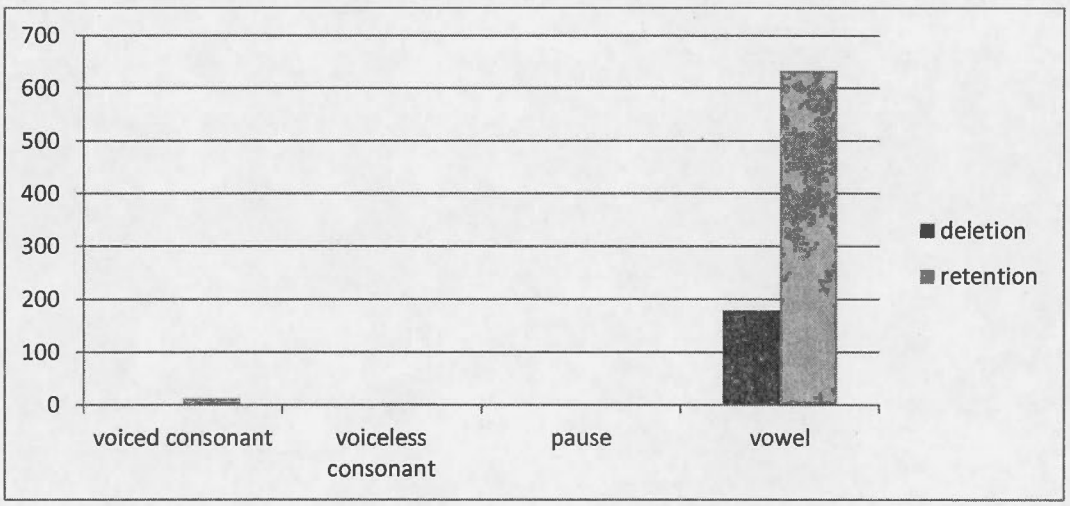

Figure 0.11 Deletion related to following environment of dental fricatives in initial onset

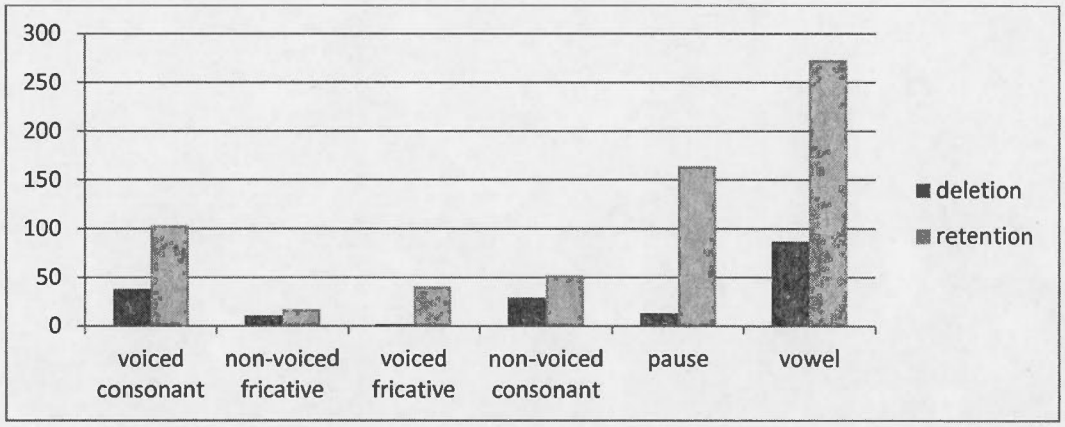

Figure 0.12 Deletion related to preceding environment of dental fricativees in initial onset

With respect to deletion of dental fricatives in final coda position, preceding environment position is most frequently occupied by vowels, which account for 519 tokens out of 528 of the tokens. There is more variation in the following environment position, but still a great tendency to find vowels in following environment as shown in figure 3.13. If a word final dental fricative is followed by a pause, then it disfavours deletion at a higher rate than if it is followed by a consonant[30] or a vowel (both p = 0.0000). A word final dental fricative is more likely to be deleted if it is followed by a consonant than by a vowel (p = 0.00042).

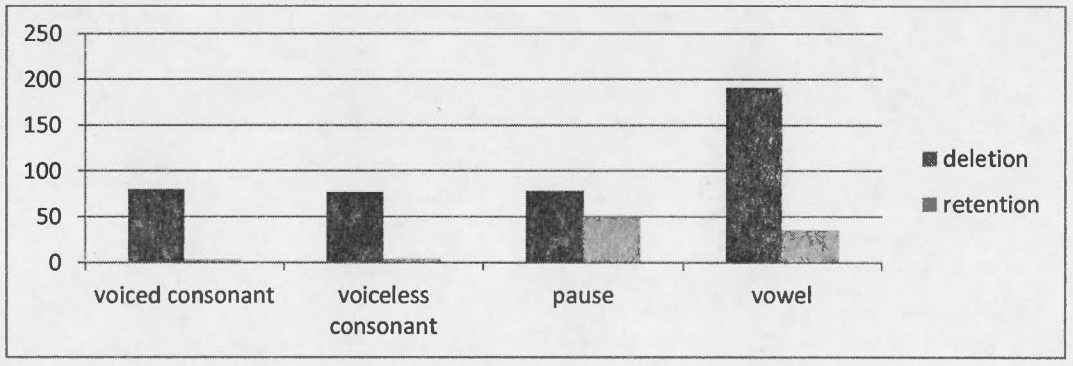

Figure 0.13 Deletion ratio of dental fricatives in final coda in relation with following environment

[30] NB. As before, fricatives are excluded from following environment and these results must be interpreted with that in mind.

Section 3.1.1.5: deletion and number of syllables in the word

Longer words have a greater tendency to favour deletion of dental fricatives than monosyllabic words ($p = 0.0002$ for disyllabic and $p = 0.0000$ for polysyllabic words) as can be noted in figure 3.14.

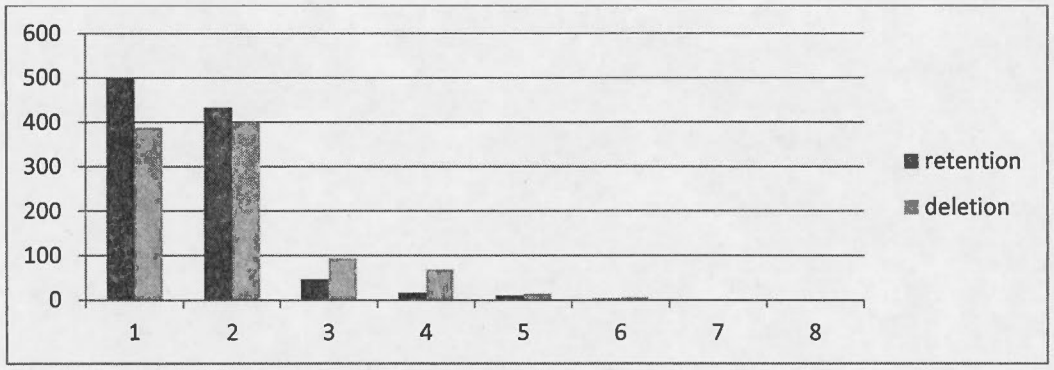

Figure 0.14 Deletion and retention in relation to number of syllables in a word

section 3.1.1.6: resuming internal factors for deletion

The deletion of dental fricatives is clearly structured by internal factors that seem to feed into each other. Initial onsets disfavour deletion while word final coda favours it. The trend for dental fricatives in word medial position falls between these two extremes. These distributional facts about the dataset have direct implications for analysis of the other internal factors given that nearly half of the tokens in the corpus are found in an initial onset position. The most frequently attested words also tend to be shorter, either mono- or disyllabic while infrequent words have up to seven syllables. As a consequence, these words comprise a higher portion of the tokens in the initial onset position, which disfavours deletion. Hence there is a negative correlation between a word's frequency and the rate of deletion; as the most frequent words disfavour deletion. Lexical words favour deletion more than function words, since the latter are more frequent than the former.

section 3.1.2: external factors for deletion

section 3.1.2.1: deletion and age

The study sample has a reasonably even age distribution, with little overlap between informants with respect to year of birth. The youngest informants are 18 years old and the oldest informant is 74, giving the study a span of 56 years in apparent time. Results of statistical analysis show a clear negative correlation ($p = 0.0001$) with respect to the effect of age on dental fricative deletion, as seen in figure 3.15.

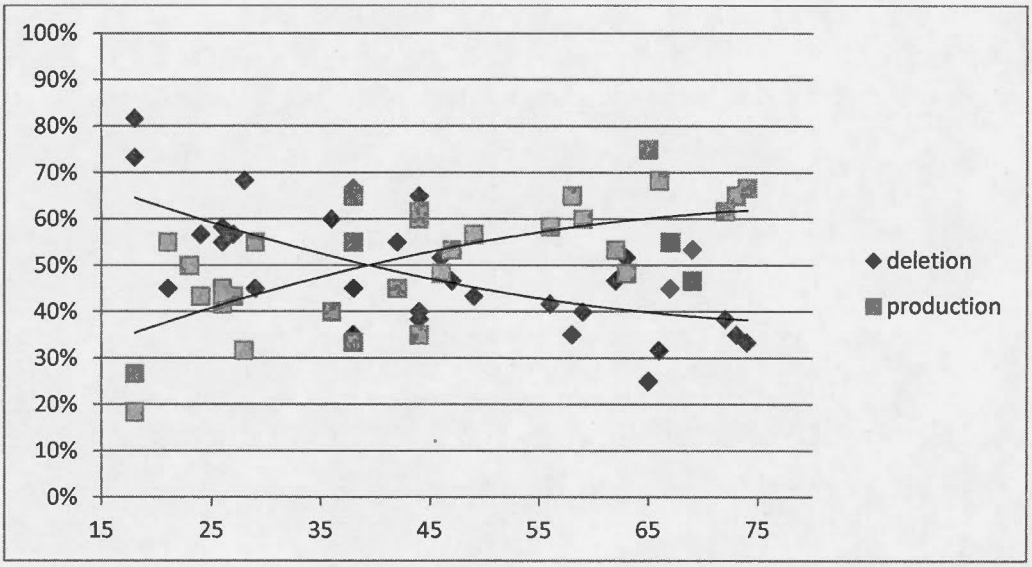

Figure 0.15 Deletion percentage related to age. Tendency for deletion decreases as age increases.

section 3.1.2.2: deletion and area

Deletion of dental fricatives seems to be widespread in Iceland. Regarding the three areas under study, western and eastern Reykjavík and the rest of the country, there is no statistically significant variation to be found (ANOVA $p = 0.8183$) with similar trends across all three populations.

The picture appears more nuanced when trends for informants from these three areas are viewed by age cohort. Older groups behave similarly one to another, that is informants in the age range 36-55 behave similarly in the three areas, and informants 56-74 years of age behave similarly. The youngest cohort from western Reykjavík shows a statistically different rate in deletion (figure 3.16) compared to the youngest groups from eastern Reykjavík (Chi square $p = 0.00494$) and from the rest of the country. The youngest cohort from western Reykjavík had a significantly greater tendency to delete the dental fricatives. It must be kept in mind that the average age of the youngest group in western Reykjavík is 22.25 years while it is 26.25 years in eastern Reykjavík. This could mean that these numbers do not necessarily show the whole picture.

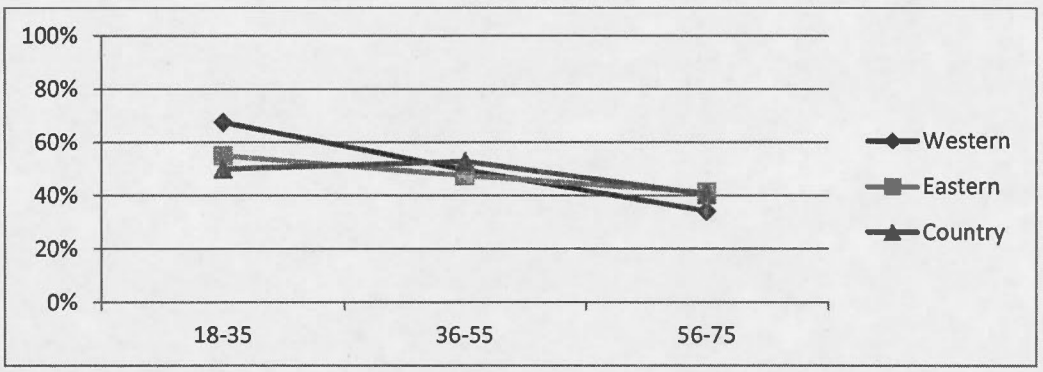

Figure 0.16 Deletion percentage for age groups in the three areas

section 3.1.2.3: deletion and sex

There is no significant difference in the rate of dental fricative deletion with respect to speaker sex (t-test $p = 0.8247$). However, when each sex is examined by age group, a significant difference for speakers from the age group 36-55 (figure 3.17); men of this age cohort favour dental fricative deletion (chi-square $p = 0.00284$) at a higher rate than women.

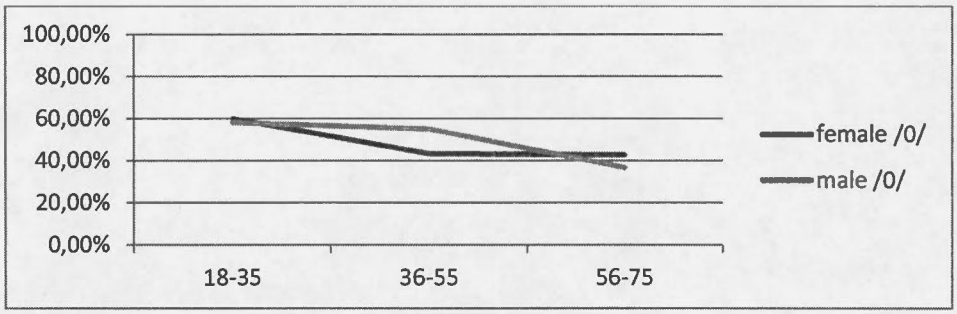

Figure 0.17 Deletion percentage for the different age groups of men and women

section 3.1.2.4: deletion and education

Results suggest that education does not have a statistically significant effect on the rate of dental fricative deletion (t-test $p = 0.3199$).

section 3.1.2.5: deletion and occupation

Results suggest that occupation does not have a statistically significant effect on the rate of dental fricative deletion (Kruskal-Wallis $p = 0.5752$).

section 3.1.2.6: deletion and origins

Results suggest that origin of the informant does not have a statistically significant effect on the rate of dental fricative deletion (Kruskal-Wallis $p = 0.3580$). However, it should be noted that a clear majority of the informants from Reykjavík were second generation residents, totaling 18 out of 24 informants from the city. With respect to first and third generation city dwellers, there were only three informants for each group respectively within the study's sample.

section 3.1.2.7: deletion and upbringing

Upbringing does not have a statistically significant effect on deletion of dental fricatives (Kruskal-Wallis $p = 0.8153$).

section 3.1.2.8: deletion and housing

Housing does not have a statistically significant effect on deletion of dental fricatives (Kruskal-Wallis $p = 0.3173$).

section 3.1.2.9: deletion and style

Results with respect to style were mixed, displaying a number of complex, interacting effects. There is a statistically significant effect for style in Sample A, with informants tending to omit the dental fricatives at higher rates in the more formal context. This difference is significant at $p = 0.0015$ for Sample A, but the effect disappears in Sample B (e.g., when a token-type restriction is imposed). This may be due to a lexical frequency effect owing to the overall tendency for a lower deletion rate in the most frequent words. It is possible that this style effect is due to an increased use of rare words in a more formal context.

Taking a closer look at Sample A, it is evident that individual word forms are on the whole proportionally as frequent in the formal and informal context, with no significant difference between the two, except for the functional word *að*. If *að* is excluded from analysis, there is a noticeable decrease in the rate of dental fricative deletion, though the difference between the analyses of Sample A with and without *að* is not statistically significant. This trend is enhanced when excluding all frequent word forms from Sample A which loses statistical significance for the stylistic variation at that point ($p = 0.512$).

There is an important stipulation to this result which must, however, be made here. It is possible that this effect for style is an artifact of the study's data extraction methodology, specifically the unbalanced data extraction from the two interview contexts. In Sample A, function words amount to almost 85 percent of the formal tokens. In contrast, function words account for 75 percent of tokens from the informal interview context, with frequent words accounting for 68 percent and 62 percent respectively of the total counts. This suggests that there are proportionally fewer words in the more formal context that delete the dental fricative. Sample B had an equal number of tokens from the two interview portions and did not show any statistically significant difference to the variation observed between the formal and informal portions of the interview.

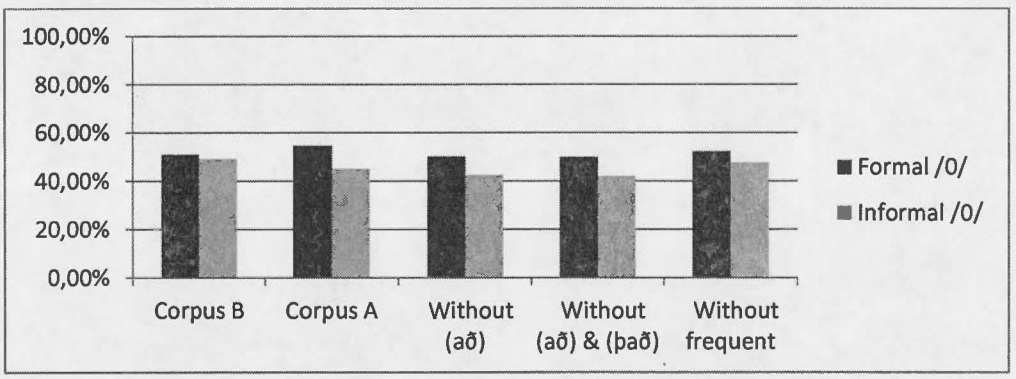

Figure 0.18 Deletion percentage in Sample A and B and in subsamples of A

As was reported earlier the effect of lexical frequency is related to syllable position. This suggests that it is necessary to examine dental fricative deletion rates in different syllable positions separately. Distinct differences in behaviour are observable between the two main positions, initial onset and final coda. Interestingly, there is a significant difference in the rate of deletion in word initial onsets ($p = 0.00185$) between the two portions of the interviews, but not in final coda position.

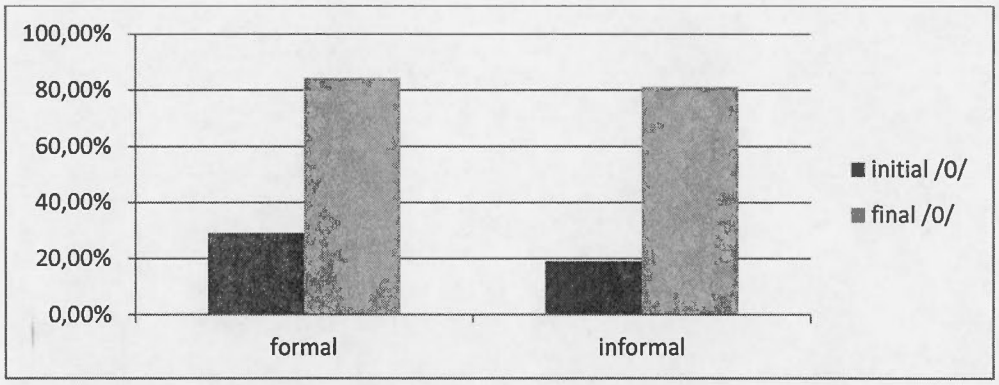

Figure 0.19 Variation in deletion in initial onset and final coda in formal and informal contexts

section 3.2.1.10: resuming external factors for deletion

Language-external factors seem to have little influence on dental fricative deletion with one clear exception, the age of the informant. The rate of deletion increases as the age of the informant decreases. There are some indications that area of residence has an influence on the youngest informants in Reykjavík, but this could also be an artifact of the design of the corpus given that the youngest age group in western Reykjavík had a lower average age than the youngest age group in eastern Reykjavík. The middle aged informants also displayed a significant correlation between the rate of deletion and informant sex, with males favouring deletion. Style shows some mixed results, with a possible effect on variation for style with a higher rate of deletion in some instances in the formal portion of the interviews than in the informal portion. Other social factors showed no statistically significant effect on variation.

section 3.2: voicing

As seen in Figure 3.20, there is robust variation in the tokens that are produced, with a predominance of voiced dental fricatives over voiceless dental fricatives. There are also attestations of a number of other non-standard variants recorded, particularly the

voiceless glottal fricative /h/, but also a handful of dental stops. These differing pronunciations are categorised as 'other' in figure 3.20. They are excluded from the following analysis as they are most likely governed by different constraints than voicing.

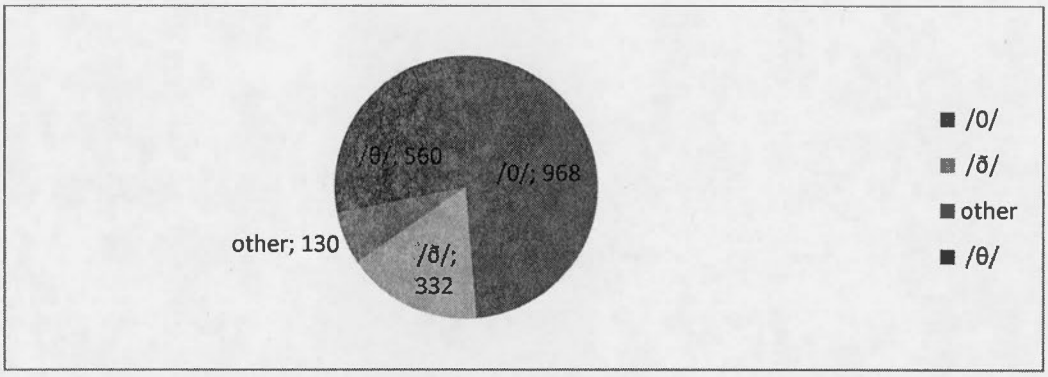

Figure 0.20 Manifestations of dental fricatives

As was indicated in Chapter 1, voicing of the dental fricatives was sensitive to syllable position as word initial onsets and word final codas should be voiceless with word internal dental fricatives should be voiced, barring some exceptions. However, a more relaxed speech style often creates a change in environment, particularly due to the cliticization of pronouns, which impacts the phonological environment. This change means that the dental fricatives found at the beginning and at the end of words become word internal. This change in syllable position should entail a voicing of the dental fricative in question. Thus, it may be inferred that there should be variation in production with respect to the target sounds position in a syllable.

section 3.2.1: syllable position

The distribution of variants within each syllable position is markedly different, as is shown in figure 3.21. There are only 27 internal coda tokens, none of which contain a voiceless variant, and only nine internal onset tokens contained a voiceless variant.

These two internal positions are excluded from further analysis due to lack of tokens and lack of variation. Section 3.2 examines the effect of style on voicing in initial onset and final coda positions.

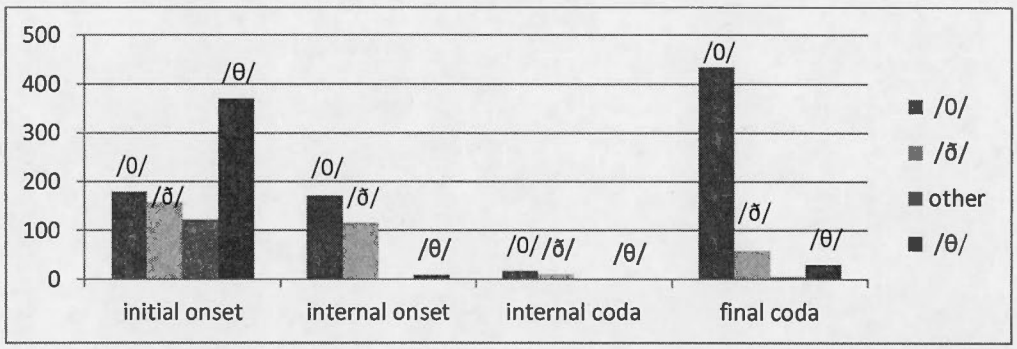

Figure 0.21 Number of tokens in Sample A depending on syllable position

There is a clear difference in the rate of voicing of dental fricatives in an initial onset or final coda, as can be seen in figure 3.22, with voicing less likely to occur in initial onset position than in final codas ($p = 0.0000$). Recall that initial onsets and final codas have different effects on the rate of dental fricative deletion. In Section 3.1, results indicated that dental fricatives in initial onsets have a much higher tendency for retention of the dental fricative while dental fricatives in final coda position were more likely to be deleted. It was also demonstrated that the phonological context was not the same for initial onsets and final codas. This argues for the separate treatment of the two syllable positions in the analysis which follows.

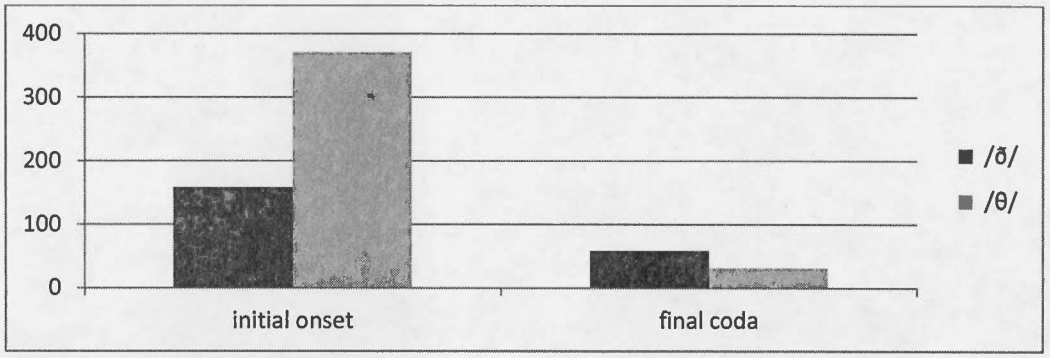

Figure 0.22 Voicing in initial onset and final coda

section 3.2.2: word initial onset

section 3.2.2.1: onset voicing and phonological environment

The preceding phonological environment has a definite effect on the voicing of initial onsets ($p = 0.000$). Voiceless 'other consonants' and pauses in the preceding segment clearly disfavour voicing, while the presence of voiced consonants (fricatives and other), voiceless fricatives, and vowels in preceding segment favour dental fricative voicing (figure 3.23).

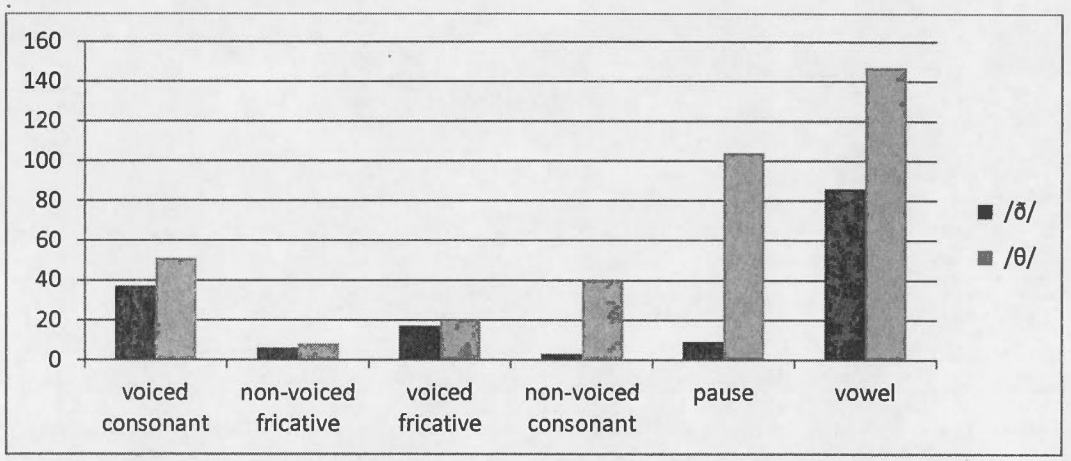

Figure 0.23 Distribution of voicing in initial onset according to preceding environment

In contrast, no statistical effect was found between the content of the following segment and the rate of dental fricative voicing, though this is likely due to the fact that vowels dominate the following phonological environment.

section 3.2.2.2: onset voicing and frequency

Frequency of a word form does not have a statistically significant effect on voicing of dental fricatives in initial onsets.

section 3.2.2.3: onset voicing and syntactic category

Results indicate that the syntactic category of the word where the dental fricative occurs has an effect on the voicing ($p = 0.0265$). Nouns and adjectives categorically disfavour voicing as all tokens are voiceless (figure 3.24). In words of other categories, underlyingly voiceless dental fricatives had a tendency to be voiced. These results should be taken with caution due to the small number of lexical words in the sample.

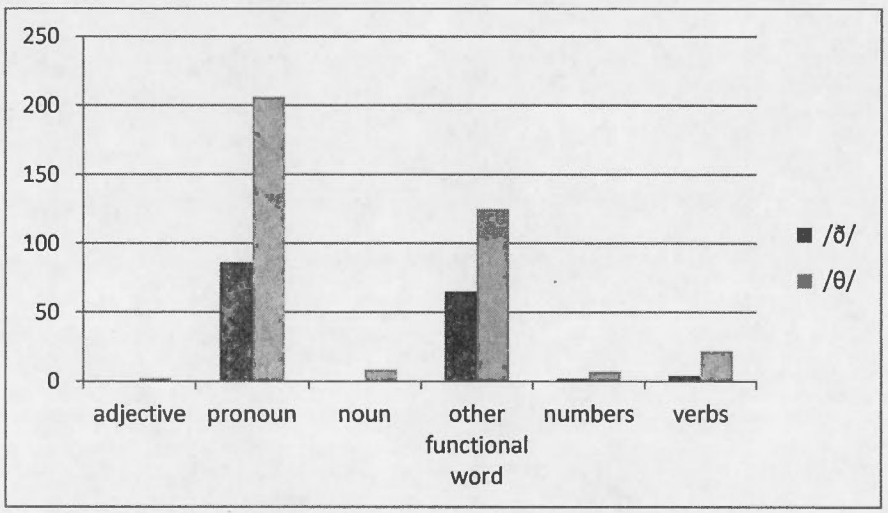

Figure 0.24 Distribution of voicing in initial onset according to word class

section 3.2.2.4: onset voicing and number of syllables

In both Sample A and Sample B, pronounced dental fricatives in initial onset position are only found in mono- and disyllabic words. Results indicate that the number of syllables in the word does not have a statistically significant effect on voicing of dental fricatives in initial onsets.

section 3.2.2.5: summary of internal factors on initial onset

Voicing of dental fricatives in an initial onset position correlates significantly with the preceding phonologic environment. Dental fricatives tend to be voiceless when preceded by a voiceless consonant (other than fricatives) or a pause and voiced when preceded by voiced consonants, voiceless fricatives and vowels. Neither word frequency nor the number of syllables per word has a significant effect on voicing. The distinction between functional and lexical words may have an effect, but this could not be confirmed due to the paucity of lexical tokens.

section 3.2.2.6: onset voicing and age

Age does not have a statistically significant effect on voicing of dental fricatives in initial onsets.

section 3.2.2.7: onset voicing and sex

Results of a univariate statistical analysis indicate that the sex of an informant has a significant effect on voicing in initial onset position with men favouring voicing more than women ($p = 0.00323$). This effect disappears, however, in the multivariate analysis.

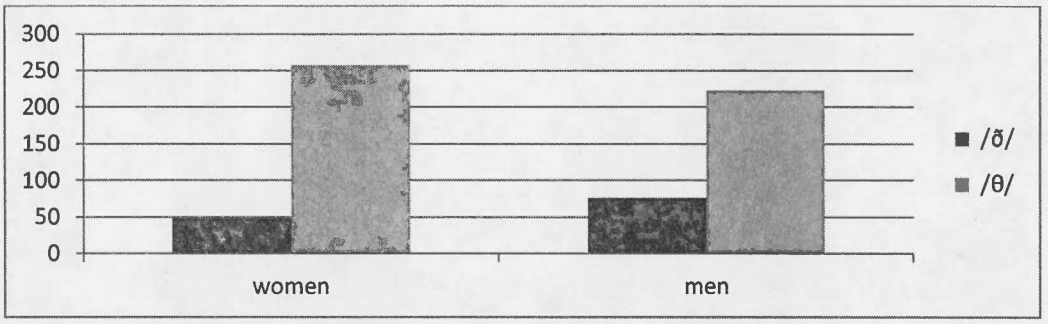

Figure 0.25 Patterns of voicing in initial onset according to sex

Results indicate significant differences in the rate of voicing by members of both sexes when examined by age groups (figure 3.26). The oldest age cohort does not indicate any statistically significant differences in the rate of dental fricative voicing between the sexes ($p = 0.6699$). However, in both the youngest and the middle age cohorts,women use significantly more voiceless dental fricatives, but there is no significant difference in the rate at which informants of these age cohorts use the voiced dental fricative.

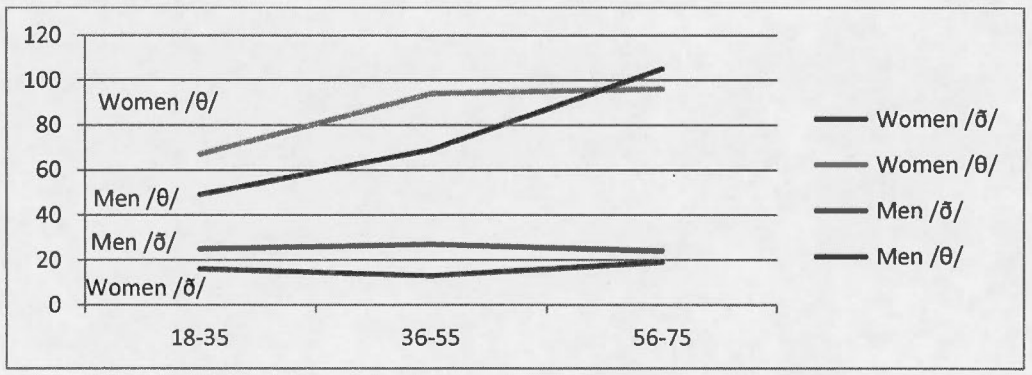

Figure 0.26 Patterns of voicing in initial onset according to age and sex

section 3.2.2.8: onset voicing and education

Education does not have a statistically significant effect on voicing of dental fricatives in initial onsets.

section 3.2.2.9: onset voicing and occupation

Results indicate that occupation has a significant effect on dental fricative voicing as informants of occupation category five favour the voiced variant ($p = 0.00743$). It seems likely that this is interference as there are only two informants in occupation category five.

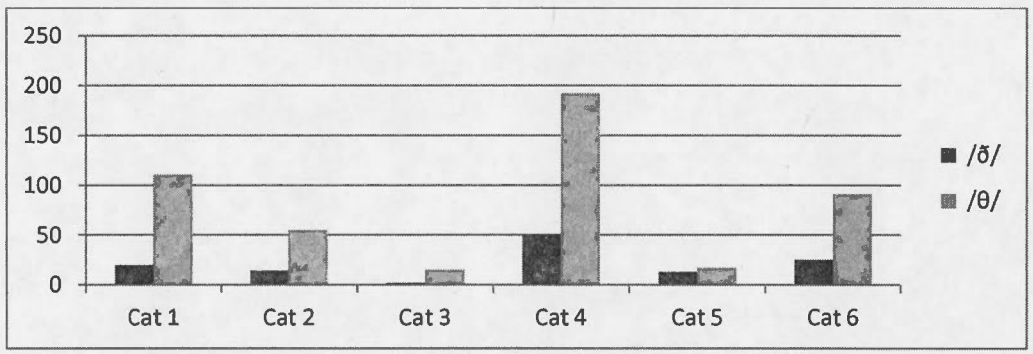

Figure 0.27 Patterns of voicing in initial onset according to occupation

section 3.2.2.10: onset voicing and housing

Housing does not have a statistically significant effect on voicing of dental fricatives in initial onsets.

section 3.2.2.11: onset voicing and origins

Origins of the informant do not have a statistically significant effect on voicing of dental fricatives in initial onsets.

section 3.2.2.12: onset voicing and upbringing

Results indicate a statistically significant effect on voicing of dental fricatives in initial onset position for the upbringing of the speaker ($p = 0.00308$). Informants who

grew up in the Eastern part of Reykjavik most strongly favoured voiced dental fricatives, followed by informants raised in the western part of the city. Informants who grew up in the country most strongly disfavoured voicing.

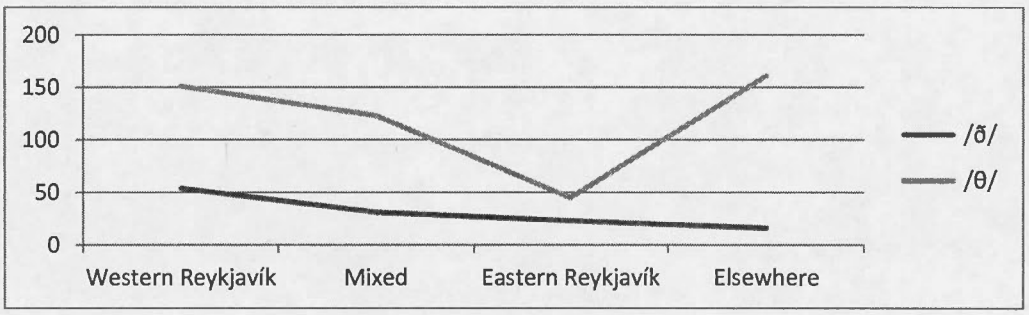

Figure 0.28 Patterns of voicing in initial onset according to upbringing

section 3.2.2.13: onset voicing and area

Results indicate an effect for area of residence on voicing($p = 0.0000$), with informants from eastern Reykjavík showing a higher rate of voiced dental fricatives than informants from western Reykjavík. Informants from outside of Reykjavík most strongly disfavoured the use of the voiced dental fricative variant (figure 3.29).

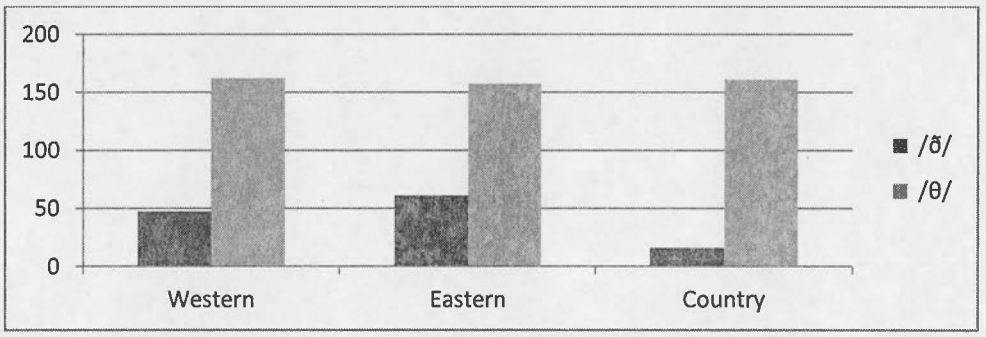

Figure 0.29 Patterns of voicing in initial onset according to Area

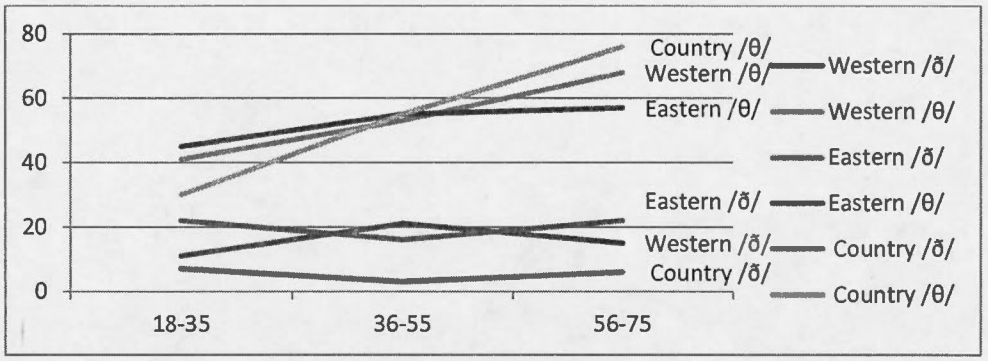

Figure 0.30 Patterns of voicing in initial onset according to age and area

section 3.2.2.14: onset voicing and style

Style does not have a statistically significant effect on voicing of dental fricatives in initial onsets.

section 3.2.2.15: summary of external factors on initial onset

Results show little evidence of significant effects for external factors on dental fricative voicing in initial onset position. No effect was observable for most factors, including age, education, housing, origin and style. Occupation, place of upbringing and area of residence, show some significant variation. This variation might nevertheless be an artefact of the design of the corpus. The oldest age group showed no statistically significant differences related to sex while results for the youngest and middle age groups indicate that men favour voicing to a greater extent than women. This seems to be related to deletion. Women produce significantly more voiceless tokens in initial onset position (and as can be recalled, men deleted more tokens), but the two groups produced about the same amount of voiced dental fricatives in initial onset position.

section 3.2.3: word final coda

section 3.2.3.1: coda voicing and phonological environment

There is not enough variation when it comes to the preceding environment of dental fricatives in final coda position to permit a statistical analysis as there are only three tokens in which the preceding segment environment is occupied by something other than a vowel. Dental fricatives in final coda position are voiced near categorically when followed by a vowel but the variation is more robust when followed by a pause.

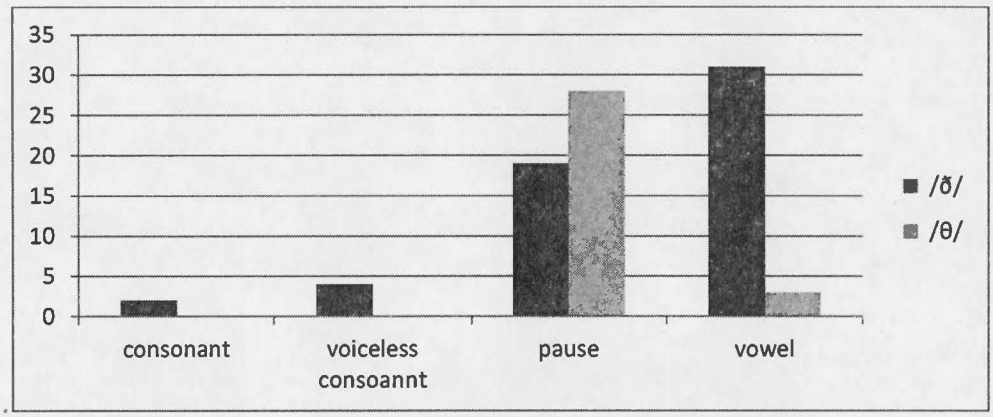

Figure 0.31 Patterns of voicing in final coda accoridng to following environment

section 3.2.3.2: coda voicing and frequency

The frequency of a word has an impact on the voicing of the final coda. More frequent words favour voicing of the final dental fricative.

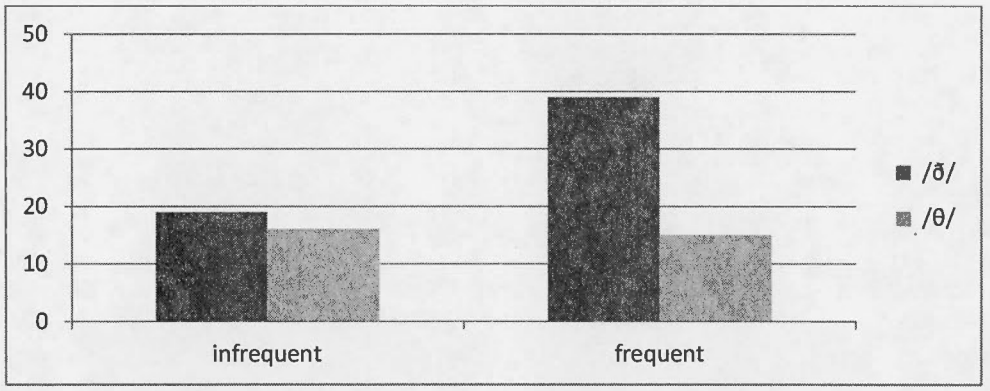

Figure 0.32 Pattern of voicing in final coda according to frequency of word

section 3.2.3.3: coda voicing and syntactic category

Syntactic category of a word does not have a statistically significant effect on voicing of dental fricatives in a final coda position.

section 3.2.3.4: coda voicing and number of syllables

The number of syllables a word contains does not have a statistically significant effect on voicing of dental fricatives in final coda position.

section 3.2.3.5: summary of internal factors on final coda

Results indicate that the contents of the following phonological environment have a significant effect on voicing of dental fricatives in word final coda position. A following vowel favours voicing but a following pause neither favours nor disfavours it. Word frequency also correlates significantly with voicing as the most frequent words favour voicing at higher rates than infrequently occurring words. Neither syntactic category nor number of syllables has an effect.

section 3.2.3.6: coda voicing and age

Age does not have a statistically significant effect on voicing of dental fricatives in a final coda position.

section 3.2.3.7: coda voicing and sex

Sex does not have a statistically significant effect on voicing of dental fricatives in a final coda position ($p = 0.10461$).

section 3.2.3.8: coda voicing and education

Education does not have a statistically significant effect on voicing of dental fricatives in a final coda position.

section 3.2.3.9: coda voicing and occupation

Occupation does not have a statistically significant effect on voicing of dental fricatives in a final coda position.

section 3.2.3.10: coda voicing and housing

Housing does not have a statistically significant effect on voicing of dental fricatives in a final coda position.

section 3.2.3.11: coda voicing and origins

Origins do not have a statistically significant effect on voicing of dental fricatives in a final coda position.

section 3.2.3.12: coda voicing and upbringing

The place where the informant was raised does not have a statistically significant effect on voicing of dental fricatives in a final coda position.

section 3.2.3.13: coda voicing and area

Area of residence does not have a statistically significant effect on voicing of dental fricatives in a final coda position.

section 3.2.3.14: coda voicing and style

Style does not have a statistically significant effect on voicing of dental fricatives in a final coda position.

section 3.2.3.15: summary of internal factors on final coda

None of the external factors has a statistically significant effect on voicing of dental fricatives in word final coda position.

section 3.3: summary

This chapter examined results of statistical effects constraining the deletion and voicing of dental fricatives in initial onset and final coda positions. With respect to language internal factors affecting dental fricative deletion, it was shown that function words favour deletion whilst lexical words disfavour it. Infrequent words had an overall higher tendency for deletion than frequent words, an apparently contradictory effect. This was related to the fact that frequent tokens (which were all function words) tended to be found in initial onsets or final codas, while tokens in infrequent words had a higher tendency to be in a word internal position.

Syllable position was shown to have a strong effect on the deletion process with dental fricatives in initial onset disfavouring deletion while dental fricatives in internal onset and final coda positions favoured it. The effect of position within the syllable was enhanced by lexical frequency. It was also shown that the phonological environment surrounding the dental fricatives has an effect on the deletion rate. A preceding vowel favours deletion, while a following vowel disfavours dental fricative deletion.

With respect to the effects of external factors on dental fricative deletion, it was shown that age has a clear effect, with the probability of deletion increasing as age decreases. The informant's area of residency does not appear to have a significant effect on the probability of deletion, with the exception that the youngest group of informants from western Reykjavík seems to slightly favour deletion over their counterparts from other areas. Other traditional external social factors did not show any statistically significant effects on dental fricative deletion.

The chapter also reported results showing that dental fricatives behave differently when it comes to voicing in word initial onsets vs. word final codas. Word initial onsets disfavour deletion and voicing. Word final codas largely favour deletion while also favouring voicing to a lesser degree. An informant's upbringing appears to have an effect on initial onset voicing as does sex of the informant. Informants from eastern Reykjavík tend to favour voicing slightly more than those from western Reykjavík and from the country. There are no other factors showing a significant influence on dental fricative voicing in the dataset.

CHAPTER IV
DISCUSSION

This chapter discusses the findings of the previous chapter in the context of the research goals and questions of the study. Specifically, it addresses the following research questions motivating the study: a) whether dental fricative variation is a robust enough to validate its use as the dependent variable in a quantitative sociolinguistic study of vernacular Icelandic and b) whether results of this study support the existence of a dialect boundary in Icelandic, as reported by earlier grammaticality judgement test studies. To this end, these results should ideally show a structured heterogeneity in the use of the dependent variable, i.e. variation that can be shown to have a statistically significant link to independent variables which constrain the variation (including language internal factors and language external social factors) thus validating the use of dental fricatives as a dependent variable. The following chapter revisits some of the results presented in the previous chapter in greater depth with respect to the study's research questions.

The chapter begins by examining the language internal factor groups in the interest of determining whether the variation is linguistically structured. It then looks at the language external social factors and puts these results in the context of the research hypotheses underlying the study, e.g. the Icelandic speech community exhibits socially constrained variation in their vernacular spoken language. Having reviewed the findings of the statistical analysis the chapter then recalls some methodological problems encountered during the study. Finally, some questions and problems for future studies of the Icelandic speech community will be addressed.

section 4.1: linguistic constraints

section 4.1.1: deletion

Several factors are readily identifiable according to this study as having an effect on dental fricative deletion in Icelandic. The variation is clearly sensitive to the position of the dental fricative within the word. The deletion of dental fricatives is strongly favoured in final coda position, while it is largely disfavoured in initial onsets. Dental fricatives in internal onset positions have an equal probability for deletion or retention. This seems to be the main effect found in this study concerning dental fricative deletion, as some of the other results can be explained with respect to syllable position.

An example of the importance of syllable position is the independent variable of syntactic category. Dental fricatives are found almost exclusively in initial onsets or final coda positions in function words (unsurprisingly as they are mostly monosyllabic). However, they show a more robust variation of syllable position in lexical words, with relatively few tokens in initial onset position. This creates the impression that dental fricatives have a greater tendency to be deleted in lexical words than functional words due to the function of the word when this is in fact an effect of the position within the syllable.

The same type of effect appears when analyzing the variation in terms of the number of syllables in a word. Polysyllabic words have a higher proportion of dental fricatives in word internal and a lower proportion of dental fricatives in word initial onset position than mono- or disyllabic words. It is therefore not surprising that words with fewer syllables seem to somewhat disfavour dental fricative deletion compared to longer words as there is a greater proportion of occurrences found in a position that favours retention in mono- and disyllabic words than longer words.

The accompanying rhyme (that which follows the variant in onset tokens and that which precedes the variant for coda tokens) does not have a significant influence on the variation. This confirms that the constraints on dental fricative deletion for the two positions differ. From this it can be extrapolated that word internal onsets, with a more even distribution of deletion vs. retention should show yet another distinct set of constraints for preceding and following environment. Broadly speaking, it can be said that the phonological environments most favourable to dental fricative deletion are a preceding vowel, a following consonant, or a pause. However, as was stated in section 3.2.1.4, this does not account for the role of syllable position. This is especially evident for dental fricatives in word initial onset position as, contrary to the trend overall, a vowel or a pause preceding a dental fricative in initial onsets disfavours deletion while a preceding consonant favours it to a relatively greater extent.[31]

section 4.1.2: voicing

Dental fricatives in initial onset and final coda positions are assumed to be underlyingly voiceless, but can be voiced in a more relaxed style (Árnason, 2011). Results of this study demonstrate a statistically significant difference between the two contexts, with initial onsets disfavouring voicing while final codas slightly favour it. When looking at the distribution in the production of the tokens in both positions we see a more robust variation in the initial onsets than in the final codas, with an overall

[31] A caveat must be made here: The possible effect of syllable deletion (as opposed to phoneme deletion) should be factored into the interpretation of these results. If the deletion of a syllable within the word directly affected the position of the dental fricative, whether by the deletion of the rhyme that it was attached to, or by triggering a change in syllabic structure by adding elements to the syllable through resyllabification, then it was excluded as a token. Árnason (2011) talks about the deletion of weak syllables in polysyllabic words as being recurrent. Do the polysyllabic words retained for this study, where the dental fricative is deleted but the syllable is not affected, adequately represent longer words? This question remains to be addressed at a later time, as the methodology used for the coding of tokens for this study does not permit comparison of the ratio between polysyllabic and mono- or disyllabic words in tokens excluded due to syllable deletion.

tendency for dental fricatives to be realized as voiceless in initial onset position and to be deleted in final coda position.

Results from this study indicate that there are phonological constraints for both syllable positions in which word boundaries play a role. If the word is preceded by a pause then the dental fricative in an initial onset position surfaces as voiceless in the speech output. Inversely, if the word is followed by a pause, then the dental fricative in the final coda position is less likely to be voiced than if it is followed by a vowel or a consonant.

When word boundaries become weakened due to relaxed speaking style, then the form of the dental fricative bordering the word boundary changes with respect to voicing. The fact that there is variation in the context of a word external vowel (compared to a preceding or following pause), unlike the categorical voicing of dental fricatives in a word internal syllable position followed by a vowel, shows that this is not a discrete difference. This is likely related to the behaviour of dental fricatives in the context of compound nouns, where they have a tendency to be realized as voiceless (Árnason, 2011).

Dental fricatives in word final position in frequent words have a higher tendency to favour voicing when compared to the same position in less frequent words. This can be interpreted as an argument for the cliticization of function words (as the frequent words are all functional). The same holds true for the variation in voicing of dental fricatives in initial onset position, where nouns and adjectives with dental fricatives in initial onset position categorically disfavour voicing.

section 4.2: social constraints

section 4.2.1: deletion

With respect to the external independent variables, it is noticeable that they show little apparent effect on variation. Education, occupation and length of stay of family in Reykjavík had no discernible effect on dental fricative deletion. The effects of style on the variation are notably mixed. The different speech contexts interview section, informal discussion and formal questionnaire have a significant effect on the deletion of dental fricatives in Sample A but not in Sample B. This suggests that answers to the formal questionnaire had a higher tendency for deletion than casual discussion, which was not expected.

The only social factor group to demonstrate a clear effect on variation is age of informant, with younger informants favouring deletion. Milroy and Gordon emphasize that age must be understood in the "context of its social significance" , i.e. the cultural capital people gain from being older (Milroy & Gordon, 2003, p. 39). This explanation downplays the importance of age as an independent variable. It also requires age to be put understood in terms of its interactions with other independent variables; variables that show little effect in this study. The little socially constrained variation found in this study nonetheless suggests that age may not always interact with other external factors, but must be treated on its own in some situations.

It is difficult to say if the age related effects on dental fricative deletion are an apparent time change or stable variation as there is no direct anterior reference point. Þráinsson and Árnason's study might nevertheless give some insight. They mention that deletion of fricatives has a negative correlation with age (1984, p. 129), as is the case for dental fricative variation in this study. However, there are several limitations to any direct comparison between these studies. Firstly, the deletion rate for dental fricatives in the Þráinsson and Árnason study is not known since the study authors

used a compound score to account for the deletion of fricatives. Secondly, the exclusion method used by Þráinsson and Árnason is not described and it is therefore impossible to say whether the two studies are measuring the same phenomenon, strictly speaking. However, given that this tendency towards deletion was in the interviews they conducted in 1979, this suggests that the variation has not undergone much adjustment in the intervening decades.

The effect had on the variation by sex of the informant was somewhat more complicated to disentangle. Neither sex demonstrated starkly different usage of dental fricative deletion. They do, however, appear to exhibit a marked behaviour difference in the rate of deletion if sex is combined with age. Middle-aged men behaved similarly to the youngest group of informants (18-35) while middle-aged women behaved like the oldest age group (56-80).

The fact that the youngest age group patterns similarly to the middle aged men but not the women does not support the conclusion that Icelandic dental fricative variation represents a change in progress.[32] It is tempting to surmise that this is a case of stable age gradation rather than a change in progress. This variation seems to be related to prestige, i.e. stylistic, as middle-aged women disfavour deletion (the non-standard pronunciation). This explanation remains somewhat problematic, however, as no effect for style as operationalized within the scope of this study was detected in the statistical analysis.

It should be emphasized that the ultimate determination as to whether or not there is a change in progress in the deletion rate of dental fricatives in Icelandic is beyond the intended scope of this study.. Additional speech data from a time span significantly

[32] Recall that women are often said to be the leaders of most linguistic changes (e.g. Labov, 1973, pp. 301-304).

removed from that covered by the corpus used in this study (whether earlier or later) would be needed in order to reach a conclusive determination.

section 4.2.2: voicing

This study suggests that there is a gender related effect on the voicing of dental fricatives in word initial onset but not in word final coda position.[33] Dividing both sexes by age group, the corpus shows a split between the sexes in the youngest and middle group in that the men favour voicing at higher rates. However, no statistically significant variation was detected between the sexes for informants from the oldest age cohort. This difference in voicing for the younger informants comes as no surprise, in light of the fact that women "style-shift more" (Tagliamonte, 2012, p. 35). Women favour the voiceless variant (i.e. the standard variant) in this context.

Voicing of dental fricatives in word initial onset and word final coda positions does not seem to be affected by social constraints, generally speaking. Variant selection in word final codas does not appear to correlate significantly with any of the language external factor groups. Initial onsets do show some effects, namely when combined with area of residence and where the informant was raised. Most informants grew up in the same area that they lived in at the time of the interviews, so these numbers largely measure the same thing, if from different perspectives. This means that there is no discernible social hierarchy revealed patterning of the voicing variant of the dependent variable.

section 4.2.3: linguistic boundary or homogeneity?

Examined collectively, the social factors do not appear to play a significant role in constraining Icelandic dental fricative variation. This near lack of variation governed

[33] There are actually only 94 tokens produced out of 528 in the word final coda position, meaning that the statistical results for voicing in final coda position are perhaps less robust than we would want.

by external factors argues against a change in progress as there is an absence of a "curvilinear pattern of social distribution" (Ash, 2002, p. 418). What kind of education a person has, what kind of job an informant does, or most of the other known factors identified as exerting an influence on language variation and change in the variationist literature, do not appear to be in effect when discussing variation in dental fricative production in the Icelandic speech community.

It must be understood that this study examines only one limited facet of Icelandic phonology, so the influence of these social factors on the whole of vernacular Icelandic cannot be entirely discounted. Nevertheless, this study appears to lend support to the position that the relative homogeneity of the island community's population is reflected in the relative lack of social variation evident in the speech production of Icelanders. Kerswill has previously noted that there exists little evidence of linguistic diversity in such cases of relative homogeneity (1994, p. 13).

This has direct implications for context dependent stylistic variability. During the course of the formal questionnaire, the informants were asked whether they were aware of any context dependent stylistic variation in Icelandic, e.g. whether they would speak to their spouse in a different manner than they would to the president. The standard response amongst the informants was that they were not aware of any such variation. This study thus contributes to confirmation of this cultural impression, as results of the statistical analyses present no conclusive indications that there is any variation in the data that can be linked to speech style as defined by the lack of any discernible differences in variant usage in casual vs. careful speech. It is possible, however, that the contrast in formality as operationalized within the bounds of the study did not present as stark a difference to the informants as was hoped. Thus, a clearer effect for stylistic variation may be evident if the informants were asked to do a formal task such as reading a word list.

There is nevertheless a linear tendency for deletion with respect to speaker age, with younger informants greatly favouring deletion of dental fricatives. Without corroborating diachronic data, it is, however, difficult to confirm whether this is an age-graded stable variation within the speech community or a change in progress. The lack of social correlates can be seen as an argument in favour of the supposition that the variation is stable across time. However, the rate at which younger informants in the study (18 – 35) favour dental fricative deletion appears to be constrained depending on where they live. Recall that informants from western Reykjavík favour deletion at a rate significantly higher than the other young informants. A difference of this kind may indicate a change in progress, as the population of older informants could not be analysed based on area of residence.

Earlier grammaticality judgement studies in Icelandic of syntactic and morphosyntactic phenomena have suggested that there is a weak linguistic boundary within Reykjavík, where teenagers from western Reykjavík have a higher tendency to conform to standard grammar than those from elsewhere in Iceland (F. Friðriksson, 2008; Maling & Sigurjónsdóttir, 2002; Svavarsdóttir, 1982; Svavarsdóttir et al., 1984). Results of the analysis of the deletion process seems to confirm this possible boundary of the judgement tests to a degree. Interestingly, however, the youngest group of informants from western Reykjavík has higher rates of use of the non-standard variant than the rest of the country. That is to say, in judgement tests looking at standard Icelandic, younger people from western Reykjavík tend to be more linguistically conservative, but when it comes to this particular phonological trait of vernacular Icelandic, they are less conservative.

Informants from the countryside had a weaker preference of dental fricative voicing in initial onset and final coda position than their counterparts from the city, who, as a whole, favoured this non-standard variation to a greater extent. This contrasts with the results for dental fricative deletion, which exhibits the split between the youngest

informants from western Reykjavík and the rest of the country. Combining these two results suggests an impression of overlapping isoglosses, with eastern Reykjavík serving as a transition zone between western Reykjavík and the rest of the country. It should be noted nevertheless that the variation remains marginal.

section 4.3: methodological problems

section 4.3.1: problems with internal factor groups

One of the most urgent issues encountered was the difficulty of identifying licit tokens due to syllable deletion, e.g. *maður* [ma:ðʏr̥] 'man', reduced to *ma'r* [maːr̥] and *jarðfræðingur* [jarθ.fræ.ðin.gur̥] 'geologist', produced as *jar'fræ'ngur* [jaːr̥.fræn.gur̥]. These shortened occurrences were excluded as per the exclusion methodology (section 2.2.1). This automatic exclusion might decrease the proportion of tokens in the study that are found in a word internal syllable position (and hence the lexical words in the dataset), which results in 80 percent of the dataset being comprised of word initial onsets or word final codas.

Árnason (2011) mentions that this word internal syllable deletion process most often affects non-stressed syllables. This suggests that deletion is most likely a prosodically motivated process, e.g., a syllable deletion phenomenon rather than a phonemic deletion. In the event that a deleted dental fricative is in an intervocalic position, however, the two vowels will either have to be merged, or pronounced more emphatically so as to render them more distinct. Otherwise, a hiatus may be inserted between them, or one of the vowels may itself be deleted in order to accommodate the dental fricative elision. As deletion is a process of improved efficiency, the economic approach would be to merge the two vowels, or delete one of them, which would exclude the token from inclusion in the dataset of this study. This means that tokens containing an authentic variant of the variable would be excluded due to their

interference with their phonological neighbours and the ensuing potential to skew the results of statistical analyses.

This relates to a more general problem with respect to what the speech output of the informants should be compared to, the surface or the assumed underlying form. As an illustrative example of the problem, consider the adjective *svolítið* [svɔ.lɪ:.t^{h} eθ] 'a little bit', which is most frequently pronounced *soldið* [sɔl.tiθ]. In this case, the reduction process does not affect the syllable containing the dental fricative, and as such it was not excluded from the dataset. However, this phenomenon does affect the syllable containing the dental fricative in other instances, such as the reduction of *þú veist* 'you know' to *þú'st,* where the structure of the syllable is altered from an open syllable to a closed one. These instances were automatically excluded but remained highly frequent in the speech of the informants; so much so that this contracted form may be interpreted to be separately lexicalized, and as such a valid token for the study.

The importance of accountably defining what the output of the informant is compared to, (e.g., either the phonological and syntactic structure assumed by prescriptive language norms, or the actual surface form pronounced in speech) renders this question fundamental in this respect. Primarily this is due to the influence over the decision as to whether an occurrence is a valid token or not, but also because it can affect how the token is coded. Take, as an example, the case of *soldið*; whether this word is analyzed with two syllables or three, might appreciably impact the overall analysis.

This reasoning can be taken a step further. Small functional words, regarded as obligatory according to prescriptive grammar norms, are often missing from the syntactic structure under study. *Að*, with a near categorical deletion of the coda, leaving only a simple rhyme, is an especially pertinent example. There are many instances where this function word is missing altogether from the syntactic structure

where its presence would be expected. Is that the result of phonological procedures engaged due to deletion of the coda because of the greater likelihood of prosodic deletions to occur in weak syllables, or because these function words are simply not present in the underlying syntactic form of natural language used in that particular instance? This has the potential to affect how the deletion process is understood.

Another methodological problem which has been discussed previously is the exclusion of fricatives from the following environment. A frequently occurring phenomenon in spoken Icelandic, this includes contexts such as *að fara* [aθ.fa:.ra] 'to go', which, due to its use as a periphrastic future, is quite common in spoken language. Due to this, a considerable proportion of the possibly available tokens are automatically excluded. Though the choices which define the study parameters may be coherent, this nevertheless means that the results are not fully representative of how the informants treat the production of dental fricatives on the whole. This is not a problem *per se* but it does limit the scope of any conclusions which might be drawn from this study's results.

The exclusion of this context was based on a similar decision made by Tagliamonte (2012, p. 196), which was based around the problems inherent to distinguishing between the two fricatives. This same argumentation might be used regarding fricatives in preceding environment. This is something that a strictly enforced methodology based on instrumental identification can resolve. A clear hierarchy of syllable positions (onset > coda) wherein it is only possible to identify one dental fricative, would permit the use of these tokens, as was the case for fricatives in preceding environment.

One of the independent variables used was the discrete distinction between lexical and function words. This distinction presents a problem of its own. A proportion of the final coda dental fricatives in nouns was in fact a part of the suffixed determiner, which is, morphologically speaking, a function morpheme. An example is *baðið*

[ba:.ðiθ] 'the bath', where the lexical stem is *bað* [baθ] and the determiner is *–ið* [iθ]. The study did not specifically account for this in the coding and it is therefore not possible to verify if the suffixed function determinant behaves differently to the lexical stem.

section 4.3.2: problems with external factor groups

The informants were recruited with the research objective of verifying the existence of a dialect difference between the eastern and western part of Reykjavík. The goal was to create three separate sample populations, two to represent the theoretical divide within Reykjavík, and one to capture any contrast between the Reykjavik speaking community and elsewhere. One guiding criterion for selection of informants was that they had to have been raised in the same area as they currently lived in. This proved to be ill conceived, primarily because eastern Reykjavík was virtually uninhabited until the 1960's. Older informants from Eastern Reykjavík were therefore necessarily migrants to that area, in this case all from Western Reykjavík. This introduces a source of possible bias into the corpus. The independent variable "upbringing" was therefore used, so as to verify whether growing up in (old) Reykjavík or the country had an influence on the variation.

It also arose during the interviews that some informants, that had been recruited based on where they had grown up, had in fact moved around as children. Some had spent all their summers (on average at least 3 months a year) outside of Reykjavík, and some had moved in and out of Reykjavík during their youth. Due to this, a separate group with mixed upbringing had to be created for the independent variable "upbringing". It is important to note that this only affected the informants from Reykjavík, and not those from the countryside. There is therefore a certain diversity in place of upbringing for informants from Reykjavík and no variation for the informants from outside of Reykjavík. This creates problems with respect to

interactions between factor groups when attempting to submit this variable to a multivariate analysis, due to overlaps with 'area'.[34]

There are similar overlap problems with some of the other independent variables meant to analyse the social effects on the dependent variable. "Origins", i.e. the family's length of stay in Reykjavík, has clear interacations with both area (as informants from outside of Reykjavík fall all outside of this criteria) and age (as older informants from Reykjavík had a tendency to be first or second generation in-migrants, while younger informants were in general second or third generation).

The study did show some tentative results regarding the effect of style on the pattern of variation as defined by the degree of formality. Previous studies (e.g.Labov, 1966) have shown that the difference in style between casual and careful speech is smaller than between casual speech and reading, particularly with respect to the reading of a word list. The lack of formal tasks to supplement the interviews is all the more unfortunate because of this since stylistic variation was based on the difference between small chatting and answering direct formally prepared questions.[35] Sociolinguistic studies have shown that informants tend to conform better to the perceived standard pronunciation of their dialect when presented with a formal task such as reading or picture identification than in more informal contexts, including formal questionnaires.

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[34] "These overlaps and interactions are problematic for logistic regression because the nature of the statistical model require that the factors being tested are orthogonal – that they are independent." (Tagliamonte, 2012, p. 132)

[35] Good practice dictates that the first 5-10 minutes of an interview should be ignored when studying the vernacular. A possible different approach when contrasting varyingly formal vernacular styles is to start the interview with the formal questionnaire, to compound the unease of the initial minutes of recording with the formality of the questionnaire, and only then go into the small talk to gather casual speech.

section 4.3.3: statistical problems

A further problem encountered during execution of this study was discovered through testing of the statistical methods and procedures used. The study relied on the treatment of deletion processes generally and of the voicing of initial onset and final coda as two discretely separate dependent variables. However, there seems to be a relation between the rate of deletion and the rate of voicing. This is most starkly evident when the sexes are divided according to age cohort, where it is found that the groups that mostly highly favour deletion tend to favour voicing as well. It seems that a lower rate of deletion increases the number of voiceless occurrences at a greater rate than the number of voiced occurrences. Another example is the voicing of word final codas, which can interact with frequency. This must be understood in the context of deletion, as frequency has an effect on deletion as well. Where voicing remain more or less constant, then the increase in the number of infrequent word tokens results in an increase in the rate of voiceless dental fricatives. Should this dependent variable be considered as a continuum of three or more states, deleted, voiceless, and voiced rather than two dichotomies, deleted vs. produced and voiced vs. voiceless? This will be left to be addressed in a future study.

section 4.4: future studies

The possible interaction between a stable language and a relatively socially homogenous speech community needs to be explored further as this may have theoretical implications for the study of variationist sociolinguistics. It has been known since the early days of sociolinguistics that social interaction affects language variation and change. How the perception of social homogeneity affects the language of a speech community is another matter. Does the lack of class consciousness and pressures applied through the language purism of a standard language ideology affect

the diachronic instability of a language, working as an inhibitor against language change and variation?

Friðriksson (2008) studied language stability and concluded that Iceland could be regarded as a stable language community. His results potentially offer an interesting perspective to the discussion of results from the current study. There does not appear to be starkly discernible hierarchical differences in Icelandic speech registers that are constrained by social class or other social factors, notwithstanding age. It has been hypothesized that one of the main engines of linguistic change within a given speech community relates to cultural prestige, with the middle class often leading linguistic change for linguistic markers with covert prestige and the upper class introducing, but not leading, linguistic markers with overt prestige connotations.[36]

These principles are based on the idea that language is a part of the (social) capital that an individual uses. If a speech community exhibits no, or hardly any, variation that can be related to this cultural (and economic) capital, what does that mean for the idea that standard language is used to gain overt prestige? The Icelandic language is an inalienable part of a normative national Icelandic identity. The importance of the literary heritage, and the importance of being well spoken both show that an individual can and will be judged on the standard of his Icelandic.[37] This supports the idea of possible social prestige for good language use. The hints of possible social variation, both in relation to sex and in relation to area, can also be interpreted this way. It is at least possible, given the fact that the dependent variable shows internal but little external constraints, to speculate that the apparent lack of social hierarchy

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[36] Overt prestige "refers to positive or negative assessments of variants (or of a speech variety) in accordance with the dominant norms of the public media, educational institutions, and middle-class speech" while covert prestige refers to language norms "implicit in lower- and working-class lifestyles", that are opposed to the middle-class norms (Mesthrie, 2001, p. 381). See also Bauvois (1997) for a short discussion on the subject.

[37] Halldór Laxness, the 1955 Nobel laureate, was appreciated for his use of the language but was considered controversial due to his eccentric orthography.

might be reflected in the relative stability of the Icelandic language. This hypothesis will be left to future studies for eventual testing.

This assumes that the variation found in the dependent variable in this study is representative of variation in Icelandic, something that is yet to be confirmed conclusively. The possible rift amongst the youngest informants in Reykjavík offers a possible lead. As it was mentioned in chapter 2, one neighborhood in the eastern part of Reykjavik, *Fellahverfi*, had a reputation for being of a lower socio-economic strata than the rest of the city. A future study could be conducted to contrast the speech of young informants from that area with young informants from a neighborhood in the western part of the city with an image of being more well-to-do in order to test whether these perceived social differences might be statistically confirmed.

Specifically pertaining to education, this study offers counter evidence to the conclusions of previous grammaticality judgement studies (on morphosyntactic variables) which report a correlation between degree of education (within the informant's family) and a stricter adherence to prescriptive grammar. Further studies are needed to address the question of how pertinent observations from written judgement tests are to the study of spoken language.

section 4.5: summary

This chapter addressed the feasibility of using dental fricatives as a dependent variable in a sociolinguistic study of Icelandic and looked at the question of a possible linguistic divide within Reykjavík. The chapter revisited the results regarding the overall patterns for dental fricative deletion and the voicing of dental fricatives in initial onset and final coda positions. It confirmed that there are linguistic constraints to the apparent variation, giving structure to the variation, which validates the use of dental fricative variation as a dependent variable for variationist studies of Icelandic. The dental fricatives showed little responsiveness to external social factors,

suggesting that the way the Icelandic speech community is traditionally portrayed may be surprisingly accurate. At the same time it challenges the supposed homogeneity of the language, as some socially constrained variation was detected, specifically related to age. Indications of a possible change in progress, in particular, were uncovered. In sum, this paves the way for future research of Icelandic using the variationist framework. This was followed by a discussion of the methodological challenges encountered during execution of this study. The chapter concludes by posing a question regarding the possible connection between relative social homogeneity and language stability.

CONCLUSIONS

How does one study a language that is reported to be linguistically stable, homogenous, and without overtly marked social language markers within the variationist framework for the study of language variation and change? This study ultimately argues that research on vernacular Icelandic does have some interest to the wider study of variationist sociolinguistics precisely due to the apparent stability of the language.

This study appeals to the social history and national identity of Icelanders to account for certain peculiar aspects of Icelandic speech data. In particular, several studies concerning the historical levelling of dialectal markers in Icelandic were cited. Previous reports of a linguistic divide within Reykjavík were noted. Following on previous observations on the phonology of vernacular Icelandic, it was proposed to use the variations in the realization of dental fricatives as a dependent variable for the quantitative sociolinguistic study of this variable linguistic phenomenon.

The variation in production of dental fricatives demonstrated evidence that it is linguistically constrained. The results of this study confirm a structured variation in the spoken vernacular, with syllable position dominating the language internal constraints in terms of the strength of effect. Unearthing statistically significant social constraints proved a more elusive proposition. Correlation with educational levels found in previous judgement tests which had informed the hypothesis that a possible linguistic divide exists in Reykjavík was not supported by any statistically significance effects on dental fricative variation in vernacular Icelandic.

Nevertheless, typical, if somewhat weak, evidence of social variation was detected, including indications that the speech of younger informants from western Reykjavík can be contrasted with informants from the rest of the country with respect to their

speech behaviour. Is this a signal of the beginning of the end of linguistic stability in Iceland? Or is this a case of age gradation where younger people will naturally assimilate into the adult community over time?

These results demonstrate that variation in the production of dental fricatives is arguably suitable for use as a dependent variable in a variationist sociolinguistic study of spoken Icelandic. The study also importantly indentifies a number of methodological adjustments which may be relevant to the construction of future studies of this speech variable. The results also show that the Icelandic speech community shows normal, if somewhat weak, social variation in the use of dental fricatives.

Finally, the study raises questions about language stability in general and asks how perceived social homogeneity affects language evolution of a speech community. How does a language behave when there are few to no social frictions to drive language variation? These are questions left to be addressed by future studies, both diachronic studies of dental fricative variation, as well as studies seeking to operationalize other dependent variables to the quantitative experimental to the study of Icelandic speech data.

APPENDIX A

INTERVIEW SCHEDULE

(WITH EXAMPLES OF GUIDLINE QUESTIONS)

(Adopted from (Tagliamonte, 2006))

- Demographics
  - What's your name?
  - Have you lived abroad?
    - Why?
  - How long?
  - Did you like it there?
- Neighbourhood
  - How long have you lived here?
  - Do people here visit each other?
- Community events
  - A lot of people say that the community used to be closer together and more co-operative than it is today, what do you think?
  - Has anything big happened here in the neighbourhood that you recal. For example a fire?
    - Where? Did you see it yourself?
- Family
  - What kind of child were you?
    - Mischievous?
    - Did you ever get into trouble?
    - Did you ever get punished? By whom?
    - Did you ever get grounded?
    - Did you ever get blamed for something that you didn't do?

- Are you *ættrækin/n* ('to nurture family ties')? Are you interested in genealogy?
  - Do you think it is important?

- Social practices
  - Do you spend a lot of time with anybody outside of the family?
    - Do they live close by? Where?
    - What do you do together?
  - Do/did you go to *sveitaböll* ('country dances')?
    - Where? With whom?

- Neighbourhood issues
  - What are the neighbours like?
    - Anybody that's nosy?
    - Trouble makers?
  - Some who are/weren't on speaking terms?
    - Why?

- Helping out in the community
  - Do you sometimes help out in the neighbourhood? How?
  - Could you ask your neighbours if you needed eggs for a recipe?

- Work
  - What was your first job?
    - How old were you when you began working?
    - Do you remember what you got paid?
    - Do you remember what you wanted to spend the money on?
  - Do young people today perceive work in the same way as your generation?

- Family meals/crafts
  - Many people have special Sunday meals. How was it in your family?
    - Anything in particular you remember eating?

- Do you like to cook? Bake? What do you like to do in the kitchen?

- Folk remedies
  - People used folk remedies back in the day. Do you remember any such remedies?
  - What did you do to prevent a cold? What did you do if you got sick?
- Folklore
  - What is your favorite fairytale/folk tale?
- Common sense
  - How would you define common sense?
  - Do you think that we get wiser with age?
- School
  - What were the teachers like?
    - Strict?
    - Compared to teachers today?
  - Did you ever get blamed for something that you didn't do?
- Teenagers
  - How do you know if somebody belongs to a particular groups?
    - Do these groups dress in a certain way?
  - Do you use the internet a lot?
    - What are you mostly doing on the internet?
- Kids/parents these days
  - Some say that children today are not like in the old days, what do you think?
    - What's the difference?
    - Why?
  - Can you compare how kids played back then and now?
- Games
  - What did you play (with) when you were about ten to twelve years?

- Did you ever play games that involved hiding?
  - What did you call it?
  - What were the rules?

- Games with balls
  - What type of ballgames did you play? (*kíló, brennó, yfir, skotbolti* 'names of Icelandic games involving balls')
    - What were the rules
    - How many per team?
- Hobbies
  - Do you have a hobby? What kind?
    - How did you get into that?
    - Do you compete?
  - Do you regularly swim?
- Birthdays
  - When is your birthday?
    - Were there any pros/cons to celebrate your birthdays then? (summer or Christmas vacation etc.)
- Peer group
  - What do teenagers around here do after school?
  - But in the evenings or weekends?
- Fights/arguments
  - Did you ever witness a fight?
    - Where?
    - What where they fighting about?
- *Útlönd* ('Foreign countries')
  - A lot of people experience trouble at the airport. Has that happened to you? (lost suitcases, missing connecting flights, customs)
  - Have language barriers ever caused amusing incidents?

- Dating
    - When did you start dating?
- Traditions
    - What kind of traditions where at your house?
        - Do you (plan to) keep these traditions alive with your own family?
    - What were your Christmas like?
        - How did they pick the tree? Who decorated it?
        - Did you get what you wished for?
        - Did you get to open one present before dinner?
        - What tradition did you have on opening the presents?
        - Did you have family gatherings?
        - What did you usually eat?
- Marriages
    - How did you meet your spouse?
    - What did your future parents-in-law think of you?
- Miscellaneous
    - Have you ever met a famous person?
        - Which one and where?
        - Did you speak to him/her?
    - Do you watch Eurovision?
        - Do you go to Eurovision-parties?
        - What was the best Eurovisionparty?
- Uncommon experiences
    - Have you ever been hospitalized?
        - For how long? Why?

- There are "connected" people in some families. *Berdreymið* ("clear dreaming") psychic, connected to the "hidden people" (*huldufólk*). Is there anybody like that in your family?
  - What talents does he/she have?
  - Can he/she predict things?

- Dreams
  - Do you sometimes have a hard time falling asleep?
    - What do you do to get some sleep?
  - Are you *berdreymin/n* ('dream clairvoyant')?
- Important historical events
  - Do you remember the British/American occupation army?
    - Did you have any relationships with the soldiers?
    - How?

APPENDIX B

FORMAL QUESTIONNAIRE ABOUT LANGUAGE

- Language
  - What do you think about the *Íslendingasögur* (the Icelandic Sagas)?
    - Is it important to be able to read them and understand?
  - Do you think it is important to speak good Icelandic?
    - What constitutes good Icelandic?
  - Some feel that Icelandic is changing. What do you think? If so, how?
  - Do you think people in Reykjavík speak differently from the rest of Iceland?
  - Do you think that there is a difference in how people speak depending on where they live or where they are from?
  - If you had to say something, where would you say that the best Icelandic is spoken?
  - Have you noticed any changes in your closest surrounding? Or in general?
  - Can you distinguish where from Iceland somebody comes based on how he/she speaks?
  - Have you had a problem understanding another Icelander?
    - What caused it?
    - How did it end?
  - Do young people speak differently to older people?
    - How?
    - Do you speak like your parents? How?
    - And your children?
  - Has anybody ever made a comment about how you speak? Why?
  - Do you use words or idioms that others don't use?

- Have you ever tried to change how you speak? How?
- Do you think that your manner of speaking affects how others perceive you? How?
    - Do you change how you speak depending on circonstances? How and where?
- A person is, for example in French and German, expected to speak differently depending on whether you are speaking to somebody you know or a stranger. Do you feel that there are those kinds of unwritten rules in Icelandic?
- What do you think about how childer and teenagers speak today?
- Should you correct a person if he/she uses a *málvilla* ("language error"), for example *þágufallssýki* (dative sickness)
    - Something else?
        - How about foreigners?
    - Do you know of other language errors?
- What do you think of language preservations policies? Is it possible to protect the language?
    - Steer it in a specific direction?
- Does Icelandic have class distinctions?
    - But Iceland?
    - Is dative sickness class specific?
- Who do you think uses more *slettur* (slang), university graduates or people without schooling?
    - How?
    - Why?
- Does everybody speak Icelandic the same way?
- The New Passive?

APPENDIX C

STATISTICAL RUNS MADE BY SCAD

Deletion ANOVA area

The GLM Procedure

Dependent Variable: P_Deletion P.Deletion

Source	DDL	Somme des carrés	Moyenne quadratique	Valeur F	Pr > F
Model	2	0.00704512	0.00352256	0.20	0.8183
Error	30	0.52357333	0.01745244		
Corrected Total	32	0.53061845			

r-carré	Coef de Var	Racine MSE	P_Deletion Moyenne
0.013277	27.03955	0.132108	0.488572

Source	DDL	Type I SS	Moyenne quadratique	Valeur F	Pr > F
Area	2	0.00704512	0.00352256	0.20	0.8183

Source	DDL	Type III SS	Moyenne quadratique	Valeur F	Pr > F
Area	2	0.00704512	0.00352256	0.20	0.8183

Deletion Kruskal-Wallis Housing

Procédure NPAR1WAY

Scores de Wilcoxon (Sommes du rang) pour la variable P_Deletion Classifiées par la variable Housingr					
Housingr	N	Somme des scores	Attendue sous H0	Ecart-type sous H0	Score moyen
5 ou 6	7	97.00	119.0	22.687414	13.857143
2 ou 3	12	205.50	204.0	26.696208	17.125000
4	5	119.50	85.0	19.898178	23.900000
0	9	139.00	153.0	24.715886	15.444444
Les scores moyens ont été utilisés pour les liens.					

Test de Kruskal-Wallis	
Khi-2	3.5269
DLL	3
Pr > Khi-2	0.3173

Deletion Kruskal-Wallis Occupation

Kruskal-Wallis pour la variable Occupationr

Procédure NPAR1WAY

Scores de Wilcoxon (Sommes du rang) pour la variable P_Deletion Classifiées par la variable Occupationr					
Occupationr	N	Somme des scores	Attendue sous H0	Ecart-type sous H0	Score moyen
3 ou 4	13	192.50	221.0	27.116646	14.807692
1 ou 2	11	203.50	187.0	26.161159	18.500000
5 ou 6	9	165.00	153.0	24.715886	18.333333
Les scores moyens ont été utilisés pour les liens.					

Test de Kruskal-Wallis	
Khi-2	1.1061
DLL	2
Pr > Khi-2	0.5752

Deletion Kruskal-Wallis Origins

Procédure NPAR1WAY

Scores de Wilcoxon (Sommes du rang) pour la variable P_Deletion Classifiées par la variable Origins_simpler					
Origins_simpler	N	Somme des scores	Attendue sous H0	Ecart-type sous H0	Score moyen
2	10	138.0	170.0	25.504289	13.800000
0 ou 1	10	168.0	170.0	25.504289	16.800000
3	13	255.0	221.0	27.116646	19.615385
Les scores moyens ont été utilisés pour les liens.					

Test de Kruskal-Wallis	
Khi-2	2.0543
DLL	2
Pr > Khi-2	0.3580

Deletion Kruskal-Wallis Upbringing

Procédure NPAR1WAY

Scores de Wilcoxon (Sommes du rang) pour la variable P_Deletion Classifiées par la variable Upbringingr					
Upbringingr	N	Somme des scores	Attendue sous H0	Ecart-type sous H0	Score moyen
w	12	218.0	204.0	26.696208	18.166667
e ou b	12	204.0	204.0	26.696208	17.000000
s	9	139.0	153.0	24.715886	15.444444
Les scores moyens ont été utilisés pour les liens.					

Test de Kruskal-Wallis	
Khi-2	0.4084
DLL	2
Pr > Khi-2	0.8153

Deletion T-test Register

The TTEST Procedure

Difference: P_Deletionf - P_Deletioni

N	Moyenne	Ecart-type	Err. type	Minimum	Maximum
33	0.0360	0.1073	0.0187	-0.1333	0.3000

Moyenne	95% Moyenne IC		Ecart-type	95% Ec.-type IC	
0.0360	-0.00204	0.0741	0.1073	0.0863	0.1419

DDL	Valeur du test t	Pr > |t|
32	1.93	0.0628

Deletion Regression Age

Procédure REG
Modèle : MODEL1
Variable dépendante : P_Deletion P.Deletion

Nb d'observations lues	33
Nb d'obs. utilisées	33

Analyse de variance					
Source	DDL	Somme des carrés	Moyenne quadratique	Valeur F	Pr > F
Modèle	1	0.23026	0.23026	23.77	<.0001
Erreur	31	0.30036	0.00969		
Total sommes corrigées	32	0.53062			

Root MSE	0.09843	R carré	0.4340
Moyenne dépendante	0.48857	R car. ajust.	0.4157
Coeff Var	20.14693		

Résultats estimés des paramètres						
Variable	Libellé	DDL	Valeur estimée des paramètres	Erreur type	Valeur du test t	Pr > |t|
Intercept	Intercept	1	0.70395	0.04739	14.86	<.0001
age	age	1	-0.00477	0.00097785	-4.87	<.0001

Deletion T-test sex

The TTEST Procedure

Variable: P_Deletion (P.Deletion)

Sex	N	Moyenne	Ecart-type	Err. type	Minimum	Maximum
f	16	0.4833	0.1171	0.0293	0.3167	0.7333
m	17	0.4935	0.1423	0.0345	0.2500	0.8167
Diff (1-2)		-0.0102	0.1307	0.0455		

Sex	Méthode	Moyenne	95% Moyenne IC		Ecart-type	95% Ec.-type IC	
f		0.4833	0.4210	0.5457	0.1171	0.0865	0.1812
m		0.4935	0.4203	0.5667	0.1423	0.1060	0.2166
Diff (1-2)	Pooled	-0.0102	-0.1030	0.0827	0.1307	0.1048	0.1738
Diff (1-2)	Satterthwaite	-0.0102	-0.1025	0.0822			

Méthode	Variances	DDL	Valeur du test t	Pr > |t|
Pooled	Equal	31	-0.22	0.8247
Satterthwaite	Unequal	30.472	-0.22	0.8237

Egalité des variances				
Méthode	DDL Num.	DDL Res.	Valeur F	Pr > F
Folded F	16	15	1.48	0.4546

Voicing ANOVA area

The GLM Procedure

Dependent Variable: P_Voiced P.Voiced

Source	DDL	Somme des carrés	Moyenne quadratique	Valeur F	Pr > F
Model	2	0.14734607	0.07367304	5.06	0.0128
Error	30	0.43674873	0.01455829		
Corrected Total	32	0.58409480			

r-carré	Coef de Var	Racine MSE	P_Voiced Moyenne
0.252264	37.75729	0.120658	0.319561

Source	DDL	Type I SS	Moyenne quadratique	Valeur F	Pr > F
Area	2	0.14734607	0.07367304	5.06	0.0128

Source	DDL	Type III SS	Moyenne quadratique	Valeur F	Pr > F
Area	2	0.14734607	0.07367304	5.06	0.0128

Voicing ANOVA area multiple comparisons

The GLM Procedure

Test de l'étendue studentisée de Tukey (HSD) pour P_Voiced

Note: This test controls the Type I experimentwise error rate.

Alpha	0.05
Degrés de liberté de l'erreur	30
Erreur quadratique moyenne	0.014558
Valeur critique de l'étendue studentisée	3.48640

Comparaisons significatives au niveau 0.05 indiquées par *.**

Area Comparaison	Différence Entre les moyennes	Simultané 95% Intervalle de confiance		
s - r	0.00436	-0.11707	0.12580	
s - c	0.15216	0.02100	0.28332	***
r - s	-0.00436	-0.12580	0.11707	
r - c	0.14780	0.01663	0.27896	***
c - s	-0.15216	-0.28332	-0.02100	***
c - r	-0.14780	-0.27896	-0.01663	***

Voicing Kruskal-Wallis Housing

Procédure NPAR1WAY

Scores de Wilcoxon (Sommes du rang) pour la variable P_Voiced Classifiées par la variable Housingr					
Housingr	N	Somme des scores	Attendue sous H0	Ecart-type sous H0	Score moyen
5 ou 6	7	161.00	119.0	22.704500	23.000000
2 ou 3	12	220.50	204.0	26.716313	18.375000
4	5	93.50	85.0	19.913164	18.700000
0	9	86.00	153.0	24.734499	9.555556
Les scores moyens ont été utilisés pour les liens.					

Test de Kruskal-Wallis	
Khi-2	8.4297
DLL	3
Pr > Khi-2	0.0379

Voicing Kruskal-Wallis Occupation

Procédure NPAR1WAY

Scores de Wilcoxon (Sommes du rang) pour la variable P_Voiced Classifiées par la variable Occupationr					
Occupationr	N	Somme des scores	Attendue sous H0	Ecart-type sous H0	Score moyen
3 ou 4	13	227.50	221.0	27.137068	17.500000
1 ou 2	11	154.00	187.0	26.180861	14.000000
5 ou 6	9	179.50	153.0	24.734499	19.944444
Les scores moyens ont été utilisés pour les liens.					

Test de Kruskal-Wallis	
Khi-2	1.9287
DLL	2
Pr > Khi-2	0.3812

Voicing Kruskal-Wallis Upbringing

Procédure NPAR1WAY

Scores de Wilcoxon (Sommes du rang) pour la variable P_Voiced Classifiées par la variable Upbringingr					
Upbringingr	N	Somme des scores	Attendue sous H0	Ecart-type sous H0	Score moyen
w	12	254.0	204.0	26.716313	21.166667
e ou b	12	221.0	204.0	26.716313	18.416667
s	9	86.0	153.0	24.734499	9.555556
Les scores moyens ont été utilisés pour les liens.					

Test de Kruskal-Wallis	
Khi-2	7.8229
DLL	2
Pr > Khi-2	0.0200

Voicing Kruskal-Wallis Origins

Procédure NPAR1WAY

Scores de Wilcoxon (Sommes du rang) pour la variable P_Voiced Classifiées par la variable Origins_simpler					
Origins_simpler	N	Somme des scores	Attendue sous H0	Ecart-type sous H0	Score moyen
2	10	230.50	170.0	25.523496	23.050000
0 ou 1	10	92.00	170.0	25.523496	9.200000
3	13	238.50	221.0	27.137068	18.346154
Les scores moyens ont été utilisés pour les liens.					

Test de Kruskal-Wallis	
Khi-2	10.6772
DLL	2
Pr > Khi-2	0.0048

Voicing regression Age

Procédure REG
Modèle : MODEL1
Variable dépendante : P_Voiced P.Voiced

Nb d'observations lues	33
Nb d'obs. utilisées	33

Analyse de variance					
Source	DDL	Somme des carrés	Moyenne quadratique	Valeur F	Pr > F
Modèle	1	0.02308	0.02308	1.28	0.2674
Erreur	31	0.56101	0.01810		
Total sommes corrigées	32	0.58409			

Root MSE	0.13453	R carré	0.0395
Moyenne dépendante	0.31956	R car. ajust.	0.0085
Coeff Var	42.09693		

Résultats estimés des paramètres						
Variable	Libellé	DDL	Valeur estimée des paramètres	Erreur type	Valeur du test t	Pr > |t|
Intercept	Intercept	1	0.25137	0.06476	3.88	0.0005
age	age	1	0.00151	0.00134	1.13	0.2674

Voicing T-test Education

The TTEST Procedure

Variable: P_Voiced (P.Voiced)

Educationr	N	Moyenne	Ecart-type	Err. type	Minimum	Maximum
3	20	0.3387	0.1534	0.0343	0.0303	0.6250
1 ou 2	13	0.2901	0.0993	0.0275	0.1500	0.5000
Diff (1-2)		0.0486	0.1351	0.0481		

Educationr	Méthode	Moyenne	95% Moyenne IC		Ecart-type	95% Ec.-type IC	
3		0.3387	0.2669	0.4105	0.1534	0.1167	0.2240
1 ou 2		0.2901	0.2301	0.3501	0.0993	0.0712	0.1640
Diff (1-2)	Pooled	0.0486	-0.0495	0.1468	0.1351	0.1083	0.1796
Diff (1-2)	Satterthwaite	0.0486	-0.0411	0.1384			

Méthode	Variances	DDL	Valeur du test t	Pr > |t|
Pooled	Equal	31	1.01	0.3199
Satterthwaite	Unequal	30.997	1.11	0.2774

Egalité des variances				
Méthode	DDL Num.	DDL Res.	Valeur F	Pr > F
Folded F	19	12	2.39	0.1265

Voicing T-test Register

The TTEST Procedure

Difference: P_Voicedf - P_Voicedi

N	Moyenne	Ecart-type	Err. type	Minimum	Maximum
33	0.0126	0.1667	0.0290	-0.3807	0.4182

Moyenne	95% Moyenne IC		Ecart-type	95% Ec.-type IC	
0.0126	-0.0465	0.0717	0.1667	0.1341	0.2205

DDL	Valeur du test t	Pr > |t|
32	0.43	0.6674

Voicing T-test Sex

The TTEST Procedure

Variable: P_Voiced (P.Voiced)

Sex	N	Moyenne	Ecart-type	Err. type	Minimum	Maximum
f	16	0.2870	0.0943	0.0236	0.1579	0.5250
m	17	0.3502	0.1616	0.0392	0.0303	0.6250
Diff (1-2)		-0.0631	0.1333	0.0464		

Sex	Méthode	Moyenne	95% Moyenne IC		Ecart-type	95% Ec.-type IC	
f		0.2870	0.2368	0.3373	0.0943	0.0697	0.1460
m		0.3502	0.2671	0.4333	0.1616	0.1203	0.2459
Diff (1-2)	Pooled	-0.0631	-0.1579	0.0316	0.1333	0.1069	0.1773
Diff (1-2)	Satterthwaite	-0.0631	-0.1571	0.0309			

Méthode	Variances	DDL	Valeur du test t	Pr > |t|
Pooled	Equal	31	-1.36	0.1839
Satterthwaite	Unequal	26.045	-1.38	0.1792

Egalité des variances				
Méthode	DDL Num.	DDL Res.	Valeur F	Pr > F
Folded F	16	15	2.93	0.0433

APPENDIX D
MULTIVARIATE RESULTS FROM SCAD

1. Multivariate model for Sample A

1.1 Deletion

1.1.1 External factor groups

Dependent variable deletion/retention with reference category retention ("P"). Occupation 2 and Housing 2 are recoded/simplified factor groups (Factors 3 and 4 merged together and 5 and 6 merged for Occupation and 5 and 6 recoded together for Housing). Following are the results of univariate models:

```
> resultats(mod.Sex)
                Estimation LowerLimit UpperLimit     p.val
(Intercept)      0.9347275  0.7203863   1.212843 0.6114991
as.factor(Sex)m  1.0442022  0.7261188   1.501625 0.8154870
> resultats(mod.age)
             Estimation LowerLimit UpperLimit        p.val
(Intercept)  2.3458641  1.6025296  3.4339948 1.156958e-05
age          0.9803083  0.9726225  0.9880548 7.329213e-07
> resultats(mod.Education)
             Estimation LowerLimit UpperLimit     p.val
(Intercept)  1.4185120  0.7840496   2.566389 0.2477847
Education2   0.6464680  0.3293713   1.268844 0.2048225
Education3   0.6488196  0.3437995   1.224454 0.1818536
> resultats(mod.Occupation)
             Estimation LowerLimit UpperLimit     p.val
(Intercept)  0.9776506  0.6685576   1.429646 0.9071975
Occupation2  1.1017855  0.5862583   2.070642 0.7633205
Occupation3  1.0943008  0.3744238   3.198232 0.8691884
Occupation4  0.8422982  0.5220089   1.359108 0.4820200
Occupation5  1.3897401  0.6204500   3.112866 0.4237630
Occupation6  1.0252635  0.5974398   1.759450 0.9278506
> resultats(mod.Occupation2)
              Estimation LowerLimit UpperLimit     p.val
(Intercept)    0.9776761  0.6652829   1.436758 0.9084872
Occupation22   1.1017023  0.5814201   2.087558 0.7664489
Occupation23   0.8595049  0.5330826   1.385805 0.5344589
Occupation26   1.0983059  0.6562639   1.838096 0.7211704
> resultats(mod.Origins.simple)
                 Estimation LowerLimit UpperLimit      p.val
(Intercept)       0.7729936  0.5698840   1.048493 0.09781631
Origins.simple0   1.1293672  0.7257680   1.757408 0.58971147
Origins.simple1   2.4212111  0.8747350   6.701759 0.08868999
Origins.simple3   1.4729701  0.9816697   2.210154 0.06139504
> resultats(mod.Upbringing)
             Estimation LowerLimit UpperLimit     p.val
(Intercept)  0.7900934  0.5547964   1.125183 0.1915065
Upbringinge  1.5702554  0.8517621   2.894824 0.1482099
Upbringings  1.1048817  0.6801491   1.794847 0.6870106
Upbringingw  1.3476659  0.8534851   2.127985 0.2004623
> resultats(mod.Housing)
             Estimation LowerLimit UpperLimit     p.val
(Intercept)  0.8730424  0.6406986   1.189644 0.38977849
Housing2     1.0334738  0.5912347   1.806505 0.90800423
Housing3     1.1125882  0.7087262   1.746588 0.64287338
Housing4     1.7908060  1.0617422   3.020494 0.02891608
Housing5     0.8060646  0.4931707   1.317475 0.38975118
Housing6     1.5026045  0.5649362   3.996593 0.41457842
> resultats(mod.Housing2)
             Estimation LowerLimit UpperLimit     p.val
(Intercept)  0.8730044  0.6361624   1.198022 0.40029242
Housing22    1.0334659  0.5837439   1.829658 0.91006850
Housing23    1.1126837  0.7015260   1.764817 0.65004562
Housing24    1.7926932  1.0503684   3.059640 0.03234084
Housing25    0.8818068  0.5457634   1.424762 0.60736474

> resultats(mod.Area)
             Estimation LowerLimit UpperLimit     p.val
(Intercept)  0.9600979  0.7120043   1.294638 0.7894914
Areac        0.9092114  0.5760532   1.435051 0.6827171
Arear        1.0613543  0.6947455   1.621418 0.7829954
> resultats(mod.Register)
             Estimation LowerLimit UpperLimit     p.val
(Intercept)  0.8860133  0.7230163   1.085757 0.2433013
Registerf    1.1633548  0.9708315   1.394057 0.1011540
```

1.1.2 Internal factor groups

Univariate results:

```
> resultats(mod.Corpus)
                  Estimation LowerLimit UpperLimit        p.val
(Intercept)        1.1457472  0.9366153  1.4015751 1.857781e-01
as.factor(Corpus)1 0.6769803  0.5638277  0.8128411 2.906183e-05
> resultats(mod.Wordtype)
            Estimation LowerLimit UpperLimit        p.val
(Intercept)  0.8308546  0.6845614   1.008411 6.076026e-02
Wordtypel    1.5800439  1.2950402   1.927769 6.557067e-06
> resultats(mod.Word.category)
                          Estimation  LowerLimit UpperLimit        p.val
(Intercept)               0.78360521 0.626568658  0.9799997 3.259352e-02
relevel(Word.category, "s")b 3.68088972 2.309567222  5.8664450 4.253989e-08
relevel(Word.category, "s")c 1.18884119 0.951617458  1.4852012 1.276879e-01
relevel(Word.category, "s")n 1.60019012 1.188610902  2.1542865 1.941922e-03
relevel(Word.category, "s")t 0.04235509 0.005648483  0.3175992 2.099219e-03
relevel(Word.category, "s")v 1.38273820 1.026366250  1.8628486 3.307718e-02
> resultats(mod.Syllables2)
            Estimation LowerLimit UpperLimit        p.val
(Intercept)  0.7686941  0.6221377  0.9497747 1.479051e-02
Syllables22  1.1831031  0.9727855  1.4388918 9.223854e-02
Syllables23  3.1904492  2.3467712  4.3374343 1.321716e-13
> resultats(mod.Syllable.position)
                  Estimation LowerLimit UpperLimit        p.val
(Intercept)        1.7047801  1.2712422  2.2861696 3.666297e-04
Syllable.positioni 0.1505645  0.1151221  0.1969186 1.765706e-43
Syllable.positionk 2.5911793  1.2269970  5.4720672 1.254731e-02
Syllable.positionw 2.4764972  1.8458567  3.3225973 1.469667e-09
> resultats(mod.Preceding.environment)
                        Estimation LowerLimit UpperLimit        p.val
(Intercept)             0.68660339 0.50237709  0.9383872 1.832557e-02
Preceding.environmentf 1.41146095 0.65886483  3.0237189 3.752953e-01
Preceding.environmentg 0.67031940 0.32866097  1.3671478 2.713312e-01
Preceding.environmentn 0.94476481 0.57203963  1.5603474 8.243415e-01
Preceding.environmentp 0.07562672 0.04058654  0.1409187 4.252144e-16
Preceding.environmentv 2.19121805 1.65888443  2.8943768 3.304190e-08
> resultats(mod.Following.environment)
                        Estimation LowerLimit UpperLimit        p.val
(Intercept)              2.7563302  1.8651616  4.0732963 3.613051e-07
Following.environmentn  3.5071585  1.7362021  7.0845210 4.688739e-04
Following.environmentp  0.5108552  0.3190761  0.8179023 5.156434e-03
Following.environmentv  0.2602234  0.1798911  0.3764289 8.871547e-13
```

Multivariate analysis results with Word type (funct. vs. lex):

```
> resultats(mfull)
                      Estimation LowerLimit UpperLimit        p.val
(Intercept)            1.9047444 0.87619167  4.1407048 1.038667e-01
as.factor(Corpus)1     0.8487793 0.62181652  1.1585834 3.017067e-01
Wordtype1              0.2707782 0.18288143  0.4009202 6.819088e-11
Syllables22            1.3953768 1.04680236  1.8600230 2.309191e-02
Syllables23            3.8085306 2.33256708  6.2184302 8.992717e-08
Syllable.positioni     0.1370720 0.09229454  0.2035735 7.006573e-23
Syllable.positionk     1.9793195 0.80537500  4.8644493 1.366964e-01
Syllable.positionw     5.0828446 3.11128063  8.3037540 8.448019e-11
Preceding.environmentf 3.1633104 1.41238217  7.0848621 5.121705e-03
Preceding.environmentg 0.8918480 0.41836021  1.9012155 7.669450e-01
Preceding.environmentn 1.7342720 1.00280154  2.9992969 4.883723e-02
Preceding.environmentp 0.1616134 0.08384227  0.3115240 5.233693e-08
Preceding.environmentv 1.0370148 0.74418678  1.4450670 8.300033e-01
Following.environmentn 1.6988562 0.77355641  3.7309657 1.867279e-01
Following.environmentp 0.2043934 0.11236466  0.3717955 1.979255e-07
Following.environmentv 1.1897429 0.69302684  2.0424723 5.286244e-01
```

Multivariate analysis results with Word category (noun, verb, pronoun etc.):

```
                                Estimation  LowerLimit UpperLimit        p.val
(Intercept)                     3.44687009 1.367156355  8.6902375 8.719853e-03
as.factor(Corpus)1              0.92340707 0.666152673  1.2800078 6.324512e-01
relevel(Word.category, "s")b    0.67798082 0.363771381  1.2635903 2.211505e-01
relevel(Word.category, "s")c    3.89355532 2.725568815  5.5620584 7.997267e-14
relevel(Word.category, "s")n    0.33225186 0.204478159  0.5398684 8.630252e-06
relevel(Word.category, "s")t    0.02884721 0.003156007  0.2636754 1.684899e-03
relevel(Word.category, "s")v    0.38308870 0.238941412  0.6141964 6.779027e-05
Syllables22                     1.50966975 1.117157697  2.0400905 7.336723e-03
Syllables23                     4.00793411 2.411848083  6.6602602 8.434495e-08
Syllable.positioni              0.07925033 0.050823567  0.1235768 4.837590e-29
Syllable.positionk              0.87355104 0.332580172  2.2944585 7.837686e-01
Syllable.positionw              3.57507772 2.187382712  5.8431387 3.721892e-07
Preceding.environmentf          3.49750654 1.484281856  8.2413943 4.195174e-03
Preceding.environmentg          0.75284451 0.347186365  1.6324802 4.721939e-01
Preceding.environmentn          1.55638946 0.880403443  2.7514070 1.280563e-01
Preceding.environmentp          0.15839735 0.080961595  0.3098966 7.393191e-08
Preceding.environmentv          1.01159070 0.719379617  1.4224976 9.471714e-01
Following.environmentn          1.11168517 0.459972278  2.6867791 8.140861e-01
Following.environmentp          0.10934447 0.053153917  0.2249357 1.809884e-09
Following.environmentv          0.46733072 0.233909815  0.9336847 3.121517e-02
```

1.2 Voicing

Only tokens in Initial onset ("i") and final coda ("w"), a total of 725 tokens, were retained. Reference category is voiced ("ð").

1.2.1 External factor groups

Univariate results:

```
> resultats(modv.Sex)
                Estimation LowerLimit UpperLimit        p.val
(Intercept)       4.289019   2.983774  6.1652410 3.698481e-15
as.factor(Sex)m   0.559212   0.342135  0.9140193 2.041425e-02
> resultats(modv.age)
            Estimation LowerLimit UpperLimit       p.val
(Intercept)  3.2955862  1.5446052   7.031498 0.002039107
age          0.9994085  0.9843712   1.014675 0.939022728
> resultats(modv.Education)
            Estimation LowerLimit UpperLimit      p.val
(Intercept)   2.965230  1.1577314   7.594671 0.02349858
Education2    1.267259  0.4410640   3.641071 0.66003823
Education3    1.007237  0.3718607   2.728245 0.98868280
> resultats(modv.Occupation)
            Estimation LowerLimit UpperLimit        p.val
(Intercept)  4.5060676  2.5585799  7.9359043 1.854250e-07
Occupation2  0.6407833  0.2615134  1.5701040 3.303775e-01
Occupation3  1.8992841  0.2943495 12.2550907 5.000911e-01
Occupation4  0.7066347  0.3552488  1.4055856 3.223343e-01
Occupation5  0.2887957  0.0918370  0.9081628 3.360346e-02
Occupation6  0.6068153  0.2793760  1.3180259 2.068606e-01
> resultats(modv.Occupation2)
            Estimation LowerLimit UpperLimit        p.val
(Intercept)  4.5614706  2.5296924   8.225116 4.522442e-07
Occupation22 0.6350915  0.2492695   1.618093 3.413845e-01
Occupation23 0.7436851  0.3654200   1.513512 4.140139e-01
Occupation26 0.5108749  0.2377300   1.097856 8.528664e-02
> resultats(modv.Origins.simple)
                Estimation LowerLimit UpperLimit        p.val
(Intercept)       2.380591  1.6155615   3.507892 1.158663e-05
Origins.simple0   2.707262  1.4474937   5.063419 1.822356e-03
Origins.simple1   1.302213  0.2596471   6.531010 7.482312e-01
Origins.simple3   1.067201  0.6283660   1.812508 8.098089e-01
> resultats(modv.Upbringing)
            Estimation LowerLimit UpperLimit        p.val
(Intercept)  3.1911377  2.0510615   4.964922 2.670478e-07
Upbringinge  0.5540408  0.2626626   1.168652 1.209671e-01
Upbringings  2.0008187  1.0485122   3.818053 3.540559e-02
Upbringingw  0.7316222  0.4158591   1.287145 2.782772e-01
> resultats(modv.Housing)
            Estimation LowerLimit UpperLimit        p.val
(Intercept)  6.4314970  3.9387553 10.5018341 1.009693e-13
Housing2     0.3782917  0.1710420  0.8366634 1.637923e-02
Housing3     0.3830254  0.1979039  0.7413116 4.392564e-03
Housing4     0.3965198  0.1815945  0.8658191 2.025421e-02
Housing5     0.3601159  0.1799541  0.7206478 3.906789e-03
Housing6     0.6090665  0.1534486  2.4175004 4.808389e-01
> resultats(modv.Housing2)
            Estimation LowerLimit UpperLimit        p.val
(Intercept)  6.4453696  3.9337280 10.5606663 1.398482e-13
Housing22    0.3781544  0.1698387  0.8419797 1.725823e-02
Housing23    0.3826784  0.1967058  0.7444762 4.668523e-03
Housing24    0.3961613  0.1803571  0.8701839 2.109091e-02
Housing25    0.3848415  0.1958098  0.7563613 5.605737e-03


> resultats(modv.Area)
            Estimation LowerLimit UpperLimit        p.val
(Intercept)   2.248797  1.5701669   3.220733 9.787608e-06
Areac         2.854516  1.5651216   5.206153 6.237727e-04
Arear         1.218766  0.7297962   2.035351 4.495722e-01
> resultats(modv.Register)
            Estimation LowerLimit UpperLimit        p.val
(Intercept)  3.3854100  2.4632354   4.652824 5.635808e-14
Registerf    0.8922693  0.6301725   1.263376 5.206047e-01
```

1.2.2 Internal factor groups

Univariate results:

```
> resultats(modv.Corpus)
                  Estimation LowerLimit UpperLimit        p.val
(Intercept)         3.114887  2.2366269   4.338014 1.775790e-11
as.factor(Corpus)1  1.054226  0.7414449   1.498956 7.687027e-01
> resultats(modv.Wordtype)
            Estimation LowerLimit UpperLimit        p.val
(Intercept)   3.077933  2.3240531   4.076357 4.387818e-15
Wordtypel     1.249841  0.7862186   1.986855 3.456845e-01
> resultats(modv.Syllables2)
            Estimation LowerLimit UpperLimit        p.val
(Intercept)  3.1892126  2.3626362   4.304970 3.528448e-14
Syllables22  0.9439608  0.6553841   1.359603 7.567132e-01
Syllables23  2.3290392  0.6759370   8.025043 1.804125e-01
> resultats(modv.Syllable.position)
                  Estimation LowerLimit UpperLimit        p.val
(Intercept)        4.1815818  3.1200294  5.6043145 1.013870e-21
Syllable.positionw 0.2668829  0.1728764  0.4120081 2.486218e-09
> resultats(modv.Preceding.environment)
                     Estimation LowerLimit UpperLimit        p.val
(Intercept)           2.1044101  1.3065428   3.389512 2.217125e-03
Preceding.environmentf 1.7963963  0.4440676   7.267000 4.113462e-01
Preceding.environmentg 0.7975301  0.2895529   2.196677 6.616378e-01
Preceding.environmentn 21.3508148  2.7912260 163.317943 3.189691e-03
Preceding.environmentp 19.1322201  6.4474080  56.773489 1.047408e-07
Preceding.environmentv 1.0102160  0.6239351   1.635645 9.670228e-01
> resultats(modv.Following.environment)
                     Estimation  LowerLimit UpperLimit        p.val
(Intercept)          17.3419277 4.071833213 73.8592281 0.0001137531
Following.environmentn  0.0295344 0.003605751  0.2419138 0.0010283389
Following.environmentp  0.1600852 0.034673876  0.7390946 0.0189065383
Following.environmentv  0.1827718 0.042983280  0.7771749 0.0213711997
```

Multivariate results:

```
> resultats(mfull)
                     Estimation  LowerLimit  UpperLimit        p.val
(Intercept)          23.42970613 3.713347529 147.8318754 7.910043e-04
as.factor(Corpus)1    1.27444792 0.795676221   2.0413046 3.129645e-01
Wordtypel             5.30455802 2.410735329  11.6720966 3.370048e-05
Syllables22           0.82193888 0.524538554   1.2879578 3.921640e-01
Syllables23           4.30081131 0.837110357  22.0962239 8.062571e-02
Syllable.positionw    0.02683153 0.009321017   0.0772374 1.983106e-11
Preceding.environmentf  1.25111615 0.278788087   5.6146288 7.699202e-01
Preceding.environmentg  0.81724679 0.280977123   2.3770345 7.110206e-01
Preceding.environmentn 26.67726757 3.280474653 216.9431806 2.133443e-03
Preceding.environmentp 19.91527616 6.509830741  60.9260425 1.574280e-07
Preceding.environmentv  1.17056084 0.687206892   1.9938867 5.622223e-01
Following.environmentn  0.22720814 0.019674086   2.6239359 2.351583e-01
Following.environmentp  1.57535134 0.242728482  10.2243125 6.338765e-01
Following.environmentv  0.07311356 0.012541524   0.4262815 3.636559e-03
```

2. Multivariate model for Sample B

2.1. Deletion

2.1.1. Internal factor groups

Univariate results:

```
> resultats(modr.Corpus)
                  Estimation LowerLimit UpperLimit        p.val
(Intercept)        0.8807625  0.6404022   1.211337 0.4348806415
as.factor(Corpus)1 1.4350972  1.1634947   1.770102 0.0007391058
> resultats(modr.Wordtype)
            Estimation LowerLimit UpperLimit       p.val
(Intercept)  1.2093746  0.9047396  1.6165834 0.199176926
Wordtype1    0.6729589  0.5277989  0.8580423 0.001398049
> resultats(modr.Word.category)
                          Estimation LowerLimit UpperLimit        p.val
(Intercept)                1.2054938  0.8732628  1.6641214 2.558948e-01
relevel(Word.category, "s")b  0.2193888  0.1071151  0.4493431 3.368852e-05
relevel(Word.category, "s")c  0.9928647  0.7904789  1.2470671 9.509047e-01
relevel(Word.category, "s")n  0.6016608  0.4141492  0.8740707 7.667647e-03
relevel(Word.category, "s")t  2.3164626  0.6089288  8.8121947 2.178340e-01
relevel(Word.category, "s")v  1.0210849  0.7109272  1.4665558 9.100634e-01
> resultats(modr.Syllables2)
            Estimation LowerLimit UpperLimit        p.val
(Intercept)  1.2071213  0.8895157  1.6381294 2.268899e-01
Syllables22  1.0111550  0.8165855  1.2520850 9.189662e-01
Syllables23  0.3261689  0.2178598  0.4883237 5.292452e-08
> resultats(modr.Syllable.position)
                  Estimation LowerLimit UpperLimit        p.val
(Intercept)        0.6861002  0.4346797  1.0829432 1.057023e-01
Syllable.positioni 5.9381963  4.3762865  8.0575564 2.637798e-30
Syllable.positionk 0.9012798  0.3774435  2.1521243 8.149413e-01
Syllable.positionw 0.2759226  0.1956182  0.3891932 2.176661e-13
> resultats(modr.Preceding.environment)
                     Estimation LowerLimit UpperLimit        p.val
(Intercept)           1.7456119  1.1374243  2.6790010 1.079669e-02
Preceding.environmentf 0.9755806  0.4230490  2.2497570 9.537539e-01
Preceding.environmentg 3.1415608  1.4462820  6.8239836 3.823930e-03
Preceding.environmentn 0.9561417  0.5578173  1.6389004 8.704194e-01
Preceding.environmentp 8.6708136  4.5560535 16.5017836 4.741088e-11
Preceding.environmentv 0.3932443  0.2862173  0.5402927 8.493428e-09
> resultats(modr.Following.environment)
                     Estimation LowerLimit UpperLimit        p.val
(Intercept)           0.2467673  0.1447161  0.4207831 2.759082e-07
Following.environmentn 0.4626969  0.2063870  1.0373157 6.133750e-02
Following.environmentp 2.8281348  1.5752870  5.0773899 4.975134e-04
Following.environmentv 5.9983100  3.7408220  9.6181327 1.034103e-13
```

Multivariate results with Word type:

	Estimation	LowerLimit	UpperLimit	p.val
(Intercept)	0.3169906	0.11521791	0.8721132	2.608082e-02
as.factor(Corpus)1	1.4300017	0.97077600	2.1064642	7.030876e-02
Wordtype1	3.5003368	2.13000394	5.7522701	7.673812e-07
Syllables22	0.6454578	0.46611464	0.8938054	8.389979e-03
Syllables23	0.2042477	0.10900377	0.3827127	7.126602e-07
Syllable.positioni	5.5444612	3.46592581	8.8695060	8.968204e-13
Syllable.positionk	2.2116366	0.75951364	6.4400903	1.455144e-01
Syllable.positionw	0.1412040	0.07983499	0.2497473	1.716060e-11
Preceding.environmentf	0.5708390	0.23775400	1.3705644	2.096228e-01
Preceding.environmentg	2.7688369	1.21323029	6.3190457	1.555796e-02
Preceding.environmentn	0.5927829	0.33240448	1.0571203	7.642949e-02
Preceding.environmentp	5.1149874	2.61067612	10.0215785	1.969722e-06
Preceding.environmentv	1.1368670	0.77965897	1.6577333	5.050333e-01
Following.environmentn	0.6647879	0.25106890	1.7602459	4.111774e-01
Following.environmentp	9.7762279	4.60448269	20.7568665	2.935864e-09
Following.environmentv	1.5726067	0.79501780	3.1107378	1.933013e-01

Multivariate results with Word category:

	Estimation	LowerLimit	UpperLimit	p.val
(Intercept)	0.2940605	0.09681370	0.8931748	3.082653e-02
as.factor(Corpus)1	1.4218727	0.95228764	2.1230160	8.525740e-02
relevel(Word.category, "s")b	1.0646575	0.41681728	2.7194064	8.958145e-01
relevel(Word.category, "s")c	0.3478827	0.24490429	0.4941620	3.720330e-09
relevel(Word.category, "s")n	2.6638001	1.44312603	4.9169863	1.730586e-03
relevel(Word.category, "s")t	2.5123400	0.48544777	13.0021247	2.720503e-01
relevel(Word.category, "s")v	3.3643870	1.88094586	6.0177703	4.321887e-05
Syllables22	0.5232737	0.37146840	0.7371162	2.116080e-04
Syllables23	0.1955447	0.10159732	0.3763655	1.033537e-06
Syllable.positioni	8.2145054	5.00333613	13.4866210	8.424245e-17
Syllable.positionk	3.6441323	1.16973915	11.3527019	2.571946e-02
Syllable.positionw	0.1672392	0.09394562	0.2977141	1.218336e-09
Preceding.environmentf	0.6007641	0.24794901	1.4556116	2.590970e-01
Preceding.environmentg	2.8874650	1.25037356	6.6679706	1.301810e-02
Preceding.environmentn	0.6902667	0.38305623	1.2438593	2.173108e-01
Preceding.environmentp	5.5806997	2.82112984	11.0396229	7.817968e-07
Preceding.environmentv	1.1545406	0.78943371	1.6885066	4.587385e-01
Following.environmentn	0.7584109	0.26770498	2.1485857	6.027276e-01
Following.environmentp	14.6040401	6.30804964	33.8104485	3.842376e-10
Following.environmentv	2.4625017	1.12505474	5.3898841	2.414431e-02

APPENDIX E

VARIOUS CROSS TABULATIONS

Deletion vs. production in functional vs. lexical words							
Sample A				Sample B			
Wordtype	Del.	Prod.	N	Wordtype	Del.	Prod.	N
Functional	604	712	1316	Functional	627	746	1373
Lexical	198	165	363	Lexical	341	265	606
Total	802	877	1679	Total	968	1011	1979

Deletion vs. production in different grammatical categories							
Sample A				Sample B			
Word.cat	Del.	Prod.	N	Word.cat	Del.	Prod.	N
Adjective	37	11	48	Adjective	78	29	107
Pronoun	347	403	750	Pronoun	301	323	624
Noun	89	66	155	Noun	141	115	256
Other func.words	252	296	548	Other func.words	317	395	712
Numerical	3	9	12	Numerical	1	28	29
Verbs	74	92	166	Verbs	130	121	251
Total	802	877	1679	Total	968	1011	1979

Deletion vs. production in frequent and infrequent words							
Sample A				Sample B			
Corpus	Del.	Prod.	N	Corpus	Del.	Prod.	N
Infrequent	315	287	602	Infrequent	562	494	1056
Frequent	487	590	1077	Frequent	406	517	923
Total	802	877	1679	Total	968	1011	1979

Distribution of functional and lexical words into syllable position							
Sample A				Sample B			
Syll.position	Funct	Lex	N	Syll.position	Funct	Lex	N
Internal onset	75	220	295	Internal onset	90	325	415
Initial onset	791	38	829	Initial onset	849	73	922
Internal Coda	9	18	27	Internal Coda	20	31	51
Final Coda	441	87	528	Final Coda	414	177	591
Total	1316	363	1679	Total	1373	606	1979

Deletion vs. production in syllable positions							
Sample A				Sample B			
Syll.position	Del.	Prod.	N	Syll.position	Del.	Prod.	N
Internal onset	171	124	295	Internal onset	257	158	415
Initial onset	180	649	829	Initial onset	201	721	922
Internal Coda	17	10	27	Internal Coda	41	10	51
Final Coda	434	94	528	Final Coda	469	122	591
Total	802	877	1679	Total	968	1011	1979

Deletion vs. Production in syllable positions in frequent vs. infrequent words								
Sample A					Sample B				
	Freqt		Infreq			Freqt		Infreq	
	Del.	Prod.	Del.	Prod.		Del.	Prod.	Del.	Prod.
Internal Onset	11	21	160	103	Internal Onset	13	16	244	142
Initial Onset	135	515	45	134	Initial Onset	113	464	88	257
Internal Coda	0	0	17	10	Internal Coda	0	0	41	10
Final Coda	341	54	93	40	Final Coda	280	37	189	85

Deletion vs. Production with different previous phonological environments							
Sample A				Sample B			
Preceding.env.	Del.	Prod.	N	Preceding.env.	Del.	Prod.	N
Voiced Other Consonant	81	126	207	Voiced Other Consonant	114	159	273
Non-voiced fricative	11	17	28	Non-voiced fricative	16	16	32
Voiced Fricative	9	52	61	Voiced Fricative	13	32	45
Non-voiced Other Consonant	32	54	86	Non-voiced Other Consonant	38	55	93
Pause	13	166	179	Pause	13	217	230
Vowel	654	462	1116	Vowel	774	532	1306
Total	802	877	1679	Total	968	1011	1979

Deletion vs. Production with different following phonological environments							
Sample A				Sample B			
Following.env.	Del.	Prod.	N	Following.env.	Del.	Prod.	N
Voiced Other Consonant	92	24	116	Voiced Other Consonant	120	44	164
Non-voiced fricative	5	0	5	Non-voiced fricative	2	0	2
Voiced Fricative	2	0	2	Voiced Fricative	104	12	116
Non-voiced Other Consonant	84	10	94	Non-voiced Other Consonant	104	73	177
Pause	79	52	131	Pause	637	882	1519
Vowel	540	791	1331	Vowel	1	0	1
Total	802	877	1679	Total	968	1011	1979

Deletion vs. Production with different preceding environments and in different syllabic positions

Sample A

	Internal Onset		Initial Onset		Internal Coda		Final Coda	
	Del.	Prod.	Del.	Prod.	Del.	Prod.	Del.	Prod.
Voiced Other Consonant	38	20	38	103	2	1	3	2
Non-voiced fricative	0	0	11	17	0	0	0	0
Voiced Fricative	7	11	2	41	0	0	0	0
Non-voiced Other Consonant	3	1	29	52	0	0	0	1
Pause	0	1	13	164	0	0	0	1
Vowel	123	91	87	272	15	9	429	90
Total	171	124	180	649	17	10	432	94

Sample B

	Internal Onset		Initial Onset		Internal Coda		Final Coda	
	Del.	Prod.	Del.	Prod.	Del.	Prod.	Del.	Prod.
Voiced Other Consonant	63	45	42	105	2	1	7	8
Non-voiced fricative	0	0	16	16	0	0	0	0
Voiced Fricative	6	10	7	20	0	0	0	2
Non-voiced Other Consonant	3	7	34	47	0	0	1	1
Pause	0	1	13	216	0	0	0	0
Vowel	185	95	89	317	39	9	461	111
Total	257	158	201	721	41	10	469	122

Deletion vs. Production with different following environments and in different syllabic positions

Sample A

	Internal Onset		Initial Onset		Internal Coda		Final Coda	
	Del.	Prod.	Del.	Prod.	Del.	Prod.	Del.	Prod.
Voiced Other Consonant	1	1	0	13	10	7	81	3
Non-voiced Other Consonant	0	1	1	3	6	2	77	4
Pause	1	0	0	0	0	0	78	52
Vowel	169	122	179	632	0	1	192	35
Total	171	124	180	648	16	10	428	94

Sample B

	Internal Onset		Initial Onset		Internal Coda		Final Coda	
	Del.	Prod.	Del.	Prod.	Del.	Prod.	Del.	Prod.
Voiced Other Consonant	2	3	0	32	26	6	92	3
Non-voiced Other Consonant	0	1	0	1	13	3	91	7
Pause	1	0	0	0	0	0	103	73
Vowel	254	154	201	688	2	1	180	39
Total	257	158	201	721	41	10	466	122

Deletion vs. Production in relation to number of syllables in word

Sample A

Syllables	Del.	Prod.	N
1	432	514	946
2	274	322	596
3	55	24	79
4	30	8	38
5	11	5	16
6	0	3	3
7	0	1	1
total	802	877	1679

Sample B

Syllables	Del.	Prod.	N
1	388	500	888
2	397	433	830
3	94	47	141
4	69	17	86
5	15	9	24
6	5	3	8
7	0	1	1
8	0	1	1
total	968	1011	1979

Deletion vs. Production in relation with age of informant			
Age	Del.	Prod.	N
18	44	16	60
18	49	11	60
21	27	33	60
23	30	30	60
24	34	26	60
26	35	25	60
26	33	27	60
27	34	26	60
28	41	19	60
30	27	32	59
36	36	24	60
38	21	39	60
38	40	20	60
38	27	33	60
42	33	27	60
44	39	21	60
44	24	36	60
44	23	37	60
46	31	29	60
47	28	32	60
49	26	34	60
56	25	35	60
58	21	39	60
59	24	36	60
62	28	32	60
63	31	29	60
65	15	45	60
66	19	41	60
67	27	33	60
69	32	28	60
72	23	37	60
73	21	39	60
74	20	40	60
Total	968	1011	1979

Deletion vs. Production in relation with Area of residence			
Area	Del.	Prod.	N
Countryside	252	288	540
Western Reykjavík	363	357	720
Eastern Reykjavík	353	366	719
Total	968	1011	1979

Deletion vs. Production in area-groups in relation with age											
Countryside-group				Western Reykjarvík-group				Eastern Reykjarvík-group			
Age	Del.	Prod	N	Age	Del.	Prod	N	Age	Del.	Prod	N
21	27	33	60	18	44	16	60	23	30	30	60
26	33	27	60	18	49	11	60	24	34	26	60
38	40	20	60	26	35	25	60	28	41	19	60
38	27	33	60	27	34	26	60	30	27	32	59
47	28	32	60	36	36	24	60	38	21	39	60
56	25	35	60	42	33	27	60	44	39	21	60
58	21	39	60	44	24	36	60	44	23	37	60
59	24	36	60	49	26	34	60	46	31	29	60
67	27	33	60	62	28	32	60	63	31	29	60
Total	252	288	540	65	15	45	60	69	32	28	60
				66	19	41	60	72	23	37	60
				74	20	40	60	73	21	39	60
				Total	363	357	720	Total	353	366	719

Deletion vs. Production in area-groups in relation with age groups									
Countryside-group			Western Reykjarvík-group			Eastern Reykjarvík-group		
	Del.	Prod.		Del.	Prod.		Del.	Prod.
18-35	60	60	18-35	162	78	18-35	132	107
36-55	95	85	36-55	119	121	36-55	114	126
56-75	97	143	56-75	82	158	56-75	107	133

Deletion vs. Production in relation to sex

Sex	Deletion	Production	N
Female	464	496	960
Male	504	515	1019
Total	968	1011	1979

Deletion vs. Production for the two sexes in relation with age

Women				Men			
Age	Del.	Prod.	N	Age	Del.	Prod.	N
18	44	16	60	18	49	11	60
21	27	33	60	23	30	30	60
24	34	26	60	26	35	25	60
27	34	26	60	26	33	27	60
28	41	19	60	30	27	32	59
38	21	39	60	36	36	24	60
44	24	36	60	38	40	20	60
46	31	29	60	38	27	33	60
47	28	32	60	42	33	27	60
49	26	34	60	44	39	21	60
56	25	35	60	44	23	37	60
63	31	29	60	58	21	39	60
66	19	41	60	59	24	36	60
67	27	33	60	62	28	32	60
69	32	28	60	65	15	45	60
74	20	40	60	72	23	37	60
				73	21	39	60
Total	464	496	960	Total	504	515	1019

Deletion vs. Production in relation with education

Education	Deletion	Production	N
Compulsory	104	76	180
Junior College	288	312	600
University	576	623	1199
Total	968	1011	1979

Deletion vs. Production in relation with Occupation			
Occupation	Deletion	Production	N
1	208	212	420
2	125	115	240
3	31	29	60
4	326	394	720
5	69	51	120
6	209	210	419
Total	968	1011	1979

Deletion vs. Production in relation with Origins			
Origins	Deletion	Production	N
Countryside	252	288	540
First Generation	39	21	60
Second Generation	263	336	599
Third Generation	414	366	780
Total	968	1011	1979

Deletion vs. Production in relation with place of upbringing			
Upbringing	Deletion	Production	N
Mixed	213	267	480
Eastern Reykjavík	132	107	239
Countryside	252	288	540
Western Reykjavík	371	349	720
Total	968	1011	1979

Deletion vs. Production in relation with housing			
Housing	Del.	Prod.	N
Countryside	252	288	540
Cat. 2	114	126	240
Cat. 3	236	243	479
Cat. 4	182	118	300
Cat. 5	150	210	360
Cat. 6	34	26	60
Total	968	1011	1979

Deletion vs. Production in relation with Style							
Sample A				Sample B			
Register	Del.	Prod.	N	Register	Del.	Prod.	N
Formal	263	216	479	Formal	501	488	989
Informal	539	661	1200	Informal	467	523	990
Total	802	877	1679	Total	968	1011	1979
Sample A excluding *að*							
Register	Del.	Prod.	N				
Formal	212	209	421				
Informal	474	645	1119				
Total	686	854	1540				
Sample A excluding *að* and *það*							
Register	Del.	Prod.	N				
Formal	141	140	281				
Informal	345	477	822				
Total	486	617	1103				
Sample A excluding frequent words							
Register	Del.	Prod.	N				
Formal	87	63	150				
Informal	228	224	452				
Total	315	287	602				

Different production patterns with regards to syllable position										
Sample A						Sample B					
	Del.	/ð/	other	/θ/	N		Del.	/ð/	other	/θ/	N
Internal onset	171	115	0	9	295	Internal onset	257	141	2	15	415
Initial onset	180	158	122	370	830	Initial onset	201	123	118	480	922
Internal Coda	17	10	0	0	27	Internal Coda	41	9	0	1	51
Final Coda	434	58	5	31	528	Final Coda	469	58	0	64	591
Total	802	341	127	410	1680	Total	968	331	120	560	1979

Variation in relation with preceding environment for initial onset

Sample A	/0/	/ð/	Oth.	/θ/	N
Voiced Other Cons.	38	37	15	51	141
Non-voiced fricative	11	6	3	8	28
Voiced Fricative	2	17	4	20	43
Non-voiced Other Cons.	29	3	9	40	81
Pause	13	9	51	104	177
Vowel	87	86	40	147	360
Total	180	158	122	370	830

Sample B	/0/	/ð/	Oth.	/θ/	N
Voiced Other Cons.	42	31	10	64	147
Non-voiced fricative	16	3	2	11	32
Voiced Fricative	7	9	1	10	27
Non-voiced Other Cons.	34	1	9	37	81
Pause	13	4	66	146	229
Vowel	89	75	30	212	406
Total	201	123	118	480	922

Variation in relation with preceding environment for final coda

Sample A	/0/	/ð/	Oth.	/θ/	N
Voiced Other Cons.	3	2	0	0	5
Non-voiced fricative	0	0	0	0	0
Voiced Fricative	0	0	0	0	0
Non-voiced Other Cons.	0	0	0	1	1
Pause	0	1	0	0	1
Vowel	429	55	5	30	519
Total	434	58	5	31	528

Sample B	/0/	/ð/	Oth.	/θ/	N
Voiced Other Cons.	7	3	0	5	15
Non-voiced fricative	0	0	0	0	0
Voiced Fricative	0	0	0	2	2
Non-voiced Other Cons.	1	0	0	1	2
Pause	0	0	0	0	0
Vowel	461	55	0	56	572
Total	469	58	0	64	591

Variation in relation with following environment for initial onset											
Sample A						Sample B					
	/0/	/ð/	Oth.	/θ/	N		/0/	/ð/	Oth.	/θ/	N
Voiced Other Cons.	0	1	0	12	13	Voiced Other Cons.	0	1	0	31	32
Non-voiced Other Cons.	1	1	0	2	4	Non-voiced Other Cons.	0	0	0	0	0
Pause	0	1	0	0	1	Pause	201	121	118	449	889
Vowel	179	155	122	356	811	Vowel	0	0	0	0	0
Total	180	158	122	370	830	Total	201	122	118	480	921

Variation in relation with following environment for final coda											
Sample A						Sample B					
	/0/	/ð/	Oth.	/θ/	N		/0/	/ð/	Oth.	/θ/	N
Voiced Other Cons.	81	2	1	0	84	Voiced Other Cons.	92	1	0	2	95
Non-voiced Other Cons.	77	4	0	0	81	Non-voiced Other Cons.	103	21	0	52	176
Pause	78	21	3	28	130	Pause	180	32	0	7	219
Vowel	192	31	1	3	227	Vowel	1	0	0	0	1
Total	428	58	5	31	522	Total	376	54	0	61	491

Variation in relation with frequency of word and initial onset											
Sample A						Sample B					
	Del.	/ð/	other	/θ/	N		Del.	/ð/	other	/θ/	N
Infr.	45	34	9	92	180	Infr.	88	49	17	191	345
Freq.	135	124	113	278	650	Freq.	113	74	101	289	577
Total	180	158	122	370	830	Total	201	123	118	480	922

Variation in relation with frequency of word and final coda											
Sample A						Sample B					
	Del.	/ð/	other	/θ/	N		Del.	/ð/	other	/θ/	N
Infr.	93	23	1	16	133	Infr.	189	32	0	53	274
Freq.	341	35	4	15	395	Freq.	280	26	0	11	317
Total	434	58	5	31	528	Total	469	58	0	64	591

Variation in relation with syntactic category and initial onset											
Sample A						Sample B					
	del	/ð/	Oth.	/θ/	N		Del.	/ð/	Oth.	/θ/	N
Adj.	0	0	0	2	2	Adj.	0	0	0	5	5
pronoun	145	86	82	206	519	pronoun	161	61	52	192	466
noun	0	0	0	8	8	noun	1	0	0	22	23
other func. words	32	65	39	125	261	other func. words	38	57	65	198	358
numbers	0	2	0	7	9	numbers	0	2	0	23	25
verbs	3	4	1	22	30	verbs	1	3	1	40	45
total	180	157	122	370	829	total	201	123	118	480	922

Variation in relation with syntactic category and final coda											
Sample A						Sample B					
	Del.	/ð/	oth	/θ/	N		del	/ð/	oth	/θ/	N
Adj.	11	1	0	2	14	Adj.	28	3	0	6	37
pronoun	199	16	1	5	221	pronoun	133	9	0	3	145
noun	11	7	1	8	27	noun	29	8	0	22	59
other func. words	179	23	3	11	216	other func. words	215	24	0	20	259
numbers	1	0	0	0	1	numbers	0	0	0	0	0
verbs	33	11	0	5	49	verbs	64	14	0	13	91
total	434	58	5	31	528	total	469	58	0	64	591

Variation in relation with number of syllables and initial onset											
Sample A						Sample B					
No.	/0/	/ð/	other	/θ/	N	No.	/0/	/ð/	other	/θ/	N
1	95	110	82	264	551	1	102	79	56	305	542
2	85	48	40	106	279	2	98	44	62	159	363
3	0	0	0	0	0	3	0	0	0	9	9
4	0	0	0	0	0	4	0	0	0	1	1
7	0	0	0	0	0	5	1	0	0	4	5
total	180	158	122	370	830	6	0	0	0	1	1
						7	0	0	0	1	1
						8	0	0	0	0	0
						total	201	123	118	480	922

Variation in relation with number of syllables and final coda

Sample A						Sample B					
Syllables	/0/	/ð/	other	/θ/	N	Syllables	/0/	/ð/	other	/θ/	N
1	336	34	4	19	393	1	285	32	0	28	345
2	89	20	1	8	118	2	161	23	0	28	212
3	4	2	0	3	9	3	10	2	0	5	17
4	5	2	0	0	7	4	11	1	0	1	13
7	0	0	0	1	1	5	1	0	0	1	2
total	434	58	5	31	528	6	1	0	0	0	1
						7	0	0	0	0	0
						8	0	0	0	1	1
						total	469	58	0	64	591

Variation in relation with style and initial onset (Formal/Informal)

Sample A						Sample B					
	/0/	/ð/	other	/θ/	N		/0/	/ð/	other	/θ/	N
For	67	38	28	98	231	For	120	55	57	217	449
Inf	113	120	94	272	599	Inf	81	68	61	263	473
Total	180	158	122	370	830	Total	201	123	118	480	922

Variation in relation with styla and final coda (Formal/Informal)

Sample A						Sample B					
	/0/	/ð/	other	/θ/	N		/0/	/ð/	other	/θ/	N
Form	160	22	0	8	190	Form	249	36	0	38	323
Infl	274	36	5	23	338	Inf	220	22	0	26	268
Total	434	58	5	31	528	Total	469	58	0	64	591

Variation in initial onset in relation with age					
Age	deleted	/ð/	other	/θ/	N
18	9	1	2	8	20
18	11	1	3	5	20
21	6	2	4	19	31
23	6	8	4	7	25
24	3	6	1	12	22
26	8	5	2	13	28
26	4	5	10	11	30
27	10	4	1	15	30
28	6	3	2	13	24
30	2	5	4	13	24
36	3	8	1	6	18
38	8	3	4	23	38
38	13	2	4	12	31
38	6	0	8	22	36
42	9	6	2	12	29
44	9	2	8	7	26
44	2	2	4	24	32
44	7	9	2	10	28
46	7	2	6	15	30
47	9	1	3	21	34
49	6	5	5	11	27
56	5	0	4	20	29
58	2	1	1	23	27
59	3	3	6	17	29
62	6	6	4	14	30
63	12	5	1	14	32
65	1	2	0	19	22
66	1	1	1	22	25
67	7	2	6	16	31
69	8	5	3	11	27
72	5	9	5	13	32
73	1	3	4	19	27
74	6	6	3	13	28
Total	201	123	118	480	922

Variation in final coda in relation with age					
Age	deleted	/ð/	other	/θ/	N
18	25	1	0	1	27
18	17	1	0	1	19
21	14	1	0	1	16
23	17	1	0	2	20
24	19	2	0	2	23
26	14	2	0	0	16
26	14	0	0	0	14
27	13	1	0	4	18
28	15	0	0	1	16
30	16	4	0	0	20
36	18	1	0	1	20
38	7	0	0	1	8
38	20	0	0	1	21
38	8	0	0	2	10
42	15	0	0	1	16
44	19	1	0	2	22
44	15	1	0	0	16
44	9	5	0	3	17
46	16	0	0	1	17
47	13	0	0	1	14
49	12	2	0	7	21
56	17	2	0	2	21
58	12	2	0	2	16
59	13	3	0	4	20
62	16	2	0	0	18
63	11	2	0	2	15
65	10	5	0	6	21
66	7	4	0	5	16
67	10	5	0	2	17
69	19	1	0	4	24
72	12	1	0	1	14
73	14	5	0	1	20
74	12	3	0	3	18
Total	469	58	0	64	591

Variation in initial onset in relation with sex					
Sex	deleted	/ð/	other	/θ/	N
Female	105	48	50	257	460
Male	96	75	68	223	462
Total	201	123	118	480	922

Variation in final coda in relation with sex					
Sex	deleted	/ð/	other	/θ/	N
Female	225	25	0	37	287
Male	244	33	0	27	304
Total	469	58	0	64	591

Variation in initial onset in relation with age											
Women						Men					
Age	/0/	/ð/	other	/θ/	Total	Age	/0/	/ð/	other	/θ/	N
18	9	1	2	8	20	18	11	1	3	5	20
21	6	2	4	19	31	23	6	8	4	7	25
24	3	6	1	12	22	26	8	5	2	13	28
27	10	4	1	15	30	26	4	5	10	11	30
28	6	3	2	13	24	30	2	5	4	13	24
38	8	3	4	23	38	36	3	8	1	6	18
44	2	2	4	24	32	38	13	2	4	12	31
46	7	2	6	15	30	38	6	0	8	22	36
47	9	1	3	21	34	42	9	6	2	12	29
49	6	5	5	11	27	44	9	2	8	7	26
56	5	0	4	20	29	44	7	9	2	10	28
63	12	5	1	14	32	58	2	1	1	23	27
66	1	1	1	22	25	59	3	3	6	17	29
67	7	2	6	16	31	62	6	6	4	14	30
69	8	5	3	11	27	65	1	2	0	19	22
74	6	6	3	13	28	72	5	9	5	13	32
Total	105	48	50	257	460	73	1	3	4	19	27
						74	0	0	0	0	0
						Total	96	75	68	223	462

Variation in final coda in relation with age									
Women					Men				
Age	Del.	/ð/	/θ/	N	Age	Del.	/ð/	/θ/	N
18	25	1	1	27	18	17	1	1	19
21	14	1	1	16	23	17	1	2	20
24	19	2	2	23	26	14	2	0	16
27	13	1	4	18	26	14	0	0	14
28	15	0	1	16	30	16	4	0	20
38	7	0	1	8	36	18	1	1	20
44	15	1	0	16	38	20	0	1	21
46	16	0	1	17	38	8	0	2	10
47	13	0	1	14	42	15	0	1	16
49	12	2	7	21	44	19	1	2	22
56	17	2	2	21	44	9	5	3	17
63	11	2	2	15	58	12	2	2	16
66	7	4	5	16	59	13	3	4	20
67	10	5	2	17	62	16	2	0	18
69	19	1	4	24	65	10	5	6	21
74	12	3	3	18	72	12	1	1	14
Total	225	25	37	287	73	14	5	1	20
					Total	244	33	27	304

Variation in initial onset in relation with education					
Education	deleted	/ð/	other	/θ/	N
Compulsory	22	9	11	32	74
Junior college	64	31	44	158	297
University	115	83	63	290	551
Total	201	123	118	480	922

Variation in final coda in relation with education					
Education	deleted	/ð/	other	/θ/	N
Compulsory	51	4	0	5	60
Junior college	139	18	0	15	172
University	279	36	0	44	359
Total	469	58	0	64	591

Variation in initial onset in relation with Occupation					
Occupation	deleted	/ð/	other	/θ/	N
Cat 1	47	20	32	110	209
Cat 2	32	14	14	55	115
Cat 3	7	2	6	15	30
Cat 4	71	50	37	192	350
Cat 5	7	13	11	17	48
Cat 6	37	24	18	91	170
Total	201	123	118	480	922

Variation in final coda in relation with Occupation					
Occupation	deleted	/ð/	other	/θ/	N
Cat 1	103	9	0	12	124
Cat 2	57	9	0	9	75
Cat 3	16	0	0	1	17
Cat 4	155	22	0	23	200
Cat 5	32	1	0	1	34
Cat 6	106	17	0	18	141
Total	469	58	0	64	591

Variation in initial onset in relation with Housing					
Housing	deleted	/ð/	other	/θ/	N
Countryside	55	16	46	161	278
Cat 2	36	19	15	54	124
Cat 3	42	40	32	110	224
Cat 4	38	16	13	57	124
Cat 5	20	28	11	83	142
Cat6	10	4	1	15	30
Total	201	123	118	480	922

Variation in final coda in relation with Housing					
Housing	deleted	/ð/	other	/θ/	N
Countryside	121	13	0	15	149
Cat 2	46	8	0	8	62
Cat 3	126	10	0	9	145
Cat 4	85	9	0	4	98
Cat 5	78	17	0	24	119
Cat6	13	1	0	4	18
Total	469	58	0	64	591

Variation in initial onset in relation with Origins					
Origins	deleted	/ð/	other	/θ/	N
Country	55	16	46	161	278
1st Gen.	9	2	8	7	26
2nd Gen.	65	51	29	142	287
3rd Gen.	72	54	35	170	331
Total	201	123	118	480	922

Variation in final coda in relation with Origins					
Origins	deleted	/ð/	other	/θ/	N
Country	121	13	0	15	149
1st Gen.	19	1	0	2	22
2nd Gen.	128	20	0	25	173
3rd Gen.	201	24	0	22	247
Total	469	58	0	64	591

Variation in initial onset in relation with place of upbringing					
Upbringing	deleted	/ð/	other	/θ/	N
Mixed	48	31	31	123	233
Eastern Reykjavík	17	22	11	45	95
Countryside	55	16	46	161	278
Western Reykjavík	81	54	30	151	316
Total	201	123	118	480	922

Variation in final coda in relation with place of upbringing					
Upbringing	deleted	/ð/	other	/θ/	N
Mixed	111	15	0	17	143
Eastern Reykjavík	67	7	0	5	79
Countryside	121	13	0	15	149
Western Reykjavík	170	23	0	27	220
Total	469	58	0	64	591

Variation in initial onset in relation with Area of Residence					
Area	deleted	/ð/	other	/θ/	N
Countryside	55	16	46	161	278
Western Reykjavík	72	47	28	162	309
Eastern Reykjavík	74	60	44	157	335
Total	201	123	118	480	922

Variation in final coda in relation with Area of Residence				
Area	deleted	/ð/	other	/θ/	N
Countryside	121	13	0	15	149
Western Reykjavík	174	23	0	29	226
Eastern Reykjavík	174	22	0	20	216
Total	469	58	0	64	591

Variation in initial onset in relation with age																
Countryside						Western Reykjavík						Eastern Reykjavík					
Age	/0/	/ð/	other	/θ/	N	Age	/0/	/ð/	other	/θ/	N	Age	/0/	/ð/	other	/θ/	N
21	6	2	4	19	31	18	9	1	2	8	20	23	6	8	4	7	25
26	4	5	10	11	30	18	11	1	3	5	20	24	3	6	1	12	22
38	13	2	4	12	31	26	8	5	2	13	28	28	6	3	2	13	24
38	6	0	8	22	36	27	10	4	1	15	30	30	2	5	4	13	24
47	9	1	3	21	34	36	3	8	1	6	18	38	8	3	4	23	38
56	5	0	4	20	29	42	9	6	2	12	29	44	9	2	8	7	26
58	2	1	1	23	27	44	2	2	4	24	32	44	7	9	2	10	28
59	3	3	6	17	29	49	6	5	5	11	27	46	7	2	6	15	30
67	7	2	6	16	31	62	6	6	4	14	30	63	12	5	1	14	32
Total	55	16	46	161	278	65	1	2	0	19	22	69	8	5	3	11	27
						66	1	1	1	22	25	72	5	9	5	13	32
						74	6	6	3	13	28	73	1	3	4	19	27
						Total				162	309	Total				157	335
							72	47	28				74	60	44		

Variation in final coda in relation with age														
Countryside					Western Reykjavík					Eastern Reykjavík				
	del	/ð/	/θ/	N		del	/ð/	/θ/	N		del	/ð/	/θ/	N
21	14	1	1	16	18	25	1	1	27	23	17	1	2	20
26	14	0	0	14	18	17	1	1	19	24	19	2	2	23
38	20	0	1	21	26	14	2	0	16	28	15	0	1	16
38	8	0	2	10	27	13	1	4	18	30	16	4	0	20
47	13	0	1	14	36	18	1	1	20	38	7	0	1	8
56	17	2	2	21	42	15	0	1	16	44	19	1	2	22
58	12	2	2	16	44	15	1	0	16	44	9	5	3	17
59	13	3	4	20	49	12	2	7	21	46	16	0	1	17
67	10	5	2	17	62	16	2	0	18	63	11	2	2	15
Tot					65	10	5	6	21	69	19	1	4	24
al	121	13	15	149	66	7	4	5	16	72	12	1	1	14
					74	12	3	3	18	73	14	5	1	20
					Tot					Tot				
					al	174	23	29	226	al	174	22	20	216

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